SPECIFICATIONS VOLUME II: TECHNICAL SPECIFICATIONS

CITY PROJECT NO. 25-15

FOR

COSTA MESA FIRE STATION NO. 2 RECONSTRUCTION

OWNER

CITY OF COSTA MESA
77 FAIR DRIVE
COSTA MESA, CA 92626

ARCHITECT

PBK
10760 4TH STREET, SUITE 200
RANCHO CUCAMONGA, CA 91730
(909) 987-0909

PROJECT W2109300AR

JULY 2026

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00 31 32 Geotechnical Data

CONTRACTING REQUIREMENTS

NOT USED

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PROCUREMENT AND CONTRACTING REQUIREMENTS

DOCUMENT 00 31 32

GEOTECHNICAL DATA

1. SUMMARY

   A. This document describes geotechnical investigations conducted at the project site and the use of data from that investigation.

2. GEOTECHNICAL INVESTIGATION REPORT

   A. A Geotechnical Report, titled Geotechnical Investigation, Proposed Costa Mesa Fire Station No. 2 Replacement, 800 Baker Street Costa Mesa, Orange County, California, dated July 25, 2024, has been prepared for the site of the Work by Leighton Consulting, Inc., a Geotechnical Engineer selected by the Owner.

   B. The Geotechnical Investigation Report has been included as an Appendix 1 to the specifications.

3. USE OF DATA

   A. Geotechnical Report was obtained by the Owner only for the Architect's use in design and is not a part of the Contract Documents.

   B. The opinions expressed in the report are those of the Geotechnical Engineer and represent interpretations for subsoil conditions, tests, and analysis of results conducted by the Geotechnical Engineer. The Architect is not responsible for the conclusions drawn from these opinions and interpretations.

   C. The report is made available for bidders' convenience and information only and is not a warranty of subsurface conditions.

   D. Any information obtained from the report as to subsurface conditions or elevations of underlying materials is approximate only and is not a guarantee of the continuity of such conditions or elevations.

   E. Any bidder using or interpreting the information described in the report shall accept full responsibility for their use and interpretation of the information.

4. EXAMINATION OF SITE

   A. Bidders shall visit the site and acquaint themselves with existing conditions.

   B. Bidders shall decide for themselves the conditions which will affect the Work and the character of the materials to be encountered in the Work.

   C. Bidders may make, at their own expense, their own subsurface investigations to satisfy themselves as to site and subsurface conditions, but such investigations will be performed only under time schedules and arrangements reviewed in advance by the Architect.

5. QUALITY ASSURANCE

   A. A Geotechnical Engineer will be retained by the Owner to observe performance of work in connection with excavation, trenching, filling, backfilling, grading, paving, and to perform compaction tests.

   B. Duties and limitations of the Geotechnical Engineer are as specified in Section 01 45 29.

   C. Readjust work performed that does not meet requirements of the Contract Documents.

   D. Make no deviation from the Contract Documents without specific and written approval of the Architect.

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SECTION 01 11 00

SUMMARY OF WORK

1. PART 1 GENERAL

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A. Work Included.

B. Work under separate contracts.

C. Work by Owner.

D. Owner furnished products.

E. Contractor use of site.

F. Work Sequence.

G. Owner occupancy.

H. Work restrictions.

1.2 WORK INCLUDED

A. Work of this Contract comprises general construction and all related site improvements of Costa Mesa Fire Station No. 2 Reconstruction located at 800 Baker Street, Costa Mesa, CA 92626 for the City of Costa Mesa, Owner.

B. Construct the work under a single lump sum contract.

C. Project is designed to comply with a Gold Certification Level according to the U.S. Green Building Council's Leadership in Energy & Environmental Design (LEED) Rating System, as specified in Division 01 Section 01 81 13 - Sustainable Design Requirements.

1.3 WORK UNDER SEPARATE CONTRACTS

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

B. Any and all references to specialty contractors shall remain the responsibility of the bidding general contractor and shall be coordinated with their subcontractors. Any work identified “by others” is also the responsibility of the bidding contractor unless a utility agency is specifically identified.

1.4 WORK BY OWNER

A. Items noted "NIC" (Not In Contract) will be furnished and installed by Owner.

B. Contractor will remove and Owner will take possession of the following items prior to start of work:

1. Westnet Alerting System: From the existing fire station.

1.5 OWNER FURNISHED PRODUCTS

A. Items noted "OFCI" (Owner-Furnished Contractor Installed) will be furnished by Owner and installed by Contractor.

B. Items noted "OFOI" (Owner-Furnished Owner Installed) will be furnished by Owner and installed by Owner.

C. Owner's Responsibilities:

1. Arrange for and deliver Owner reviewed Shop Drawings, Product Data, and Samples to Contractor.

2. Arrange and pay for Product delivery to site.

3. On delivery, inspect Products jointly with Contractor.

4. Submit claims for transportation damage and replace damaged, defective, or deficient items.

5. Arrange for manufacturer's warranties, inspections, and service.

D. Contractor's Responsibilities:

1. Review Owner reviewed Shop Drawings, Product Data, and Samples.

2. Receive and unload Products at site; inspect for completeness or damage, jointly with Owner.

3. Handle, store, install and finish Products.

4. Repair or replace items damaged after receipt.

1.6 CONTRACTOR USE OF SITE

A. Limit use of site to allow:

1. Owner occupancy.

B. Construction Operations: Limited to area indicated on drawings.

1.7 WORK SEQUENCE

A. Construct work in the phases as depicted in the drawings to accommodate Owner's occupancy requirements during the construction period with each phase substantially complete before beginning the next phase. Coordinate construction schedule and operations with Owner.

1.8 OWNER OCCUPANCY

A. Partial Owner Occupancy: Owner will occupy the site during entire construction period, with the exception of areas under construction.

B. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.

C. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.

D. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.

E. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.

F. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

G. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage.

H. Perform the Work so as not to interfere with Owner's day-to-day operations.

I. Maintain existing exits, unless otherwise indicated.

J. Provide not less than 72 hours notice to Owner of activities that will affect Owner's operations.

1.9 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed during normal business working hours, Monday through Friday, except as otherwise indicated or required to conform to construction schedule and labor codes.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted to do so and then only after arranging to provide temporary utility services according to requirements indicated.

1. Notify Owner not less than 5 days in advance of proposed utility interruptions. Do not proceed with utility interruptions without Architect’s permission.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Schedule of Values.

B. Application for Payment.

C. Defect assessment.

D. Non-payment for rejected work.

E. Change procedures.

1.2 SCHEDULE OF VALUES

A. Submit Schedule of Values for approval in duplicate within ten days after receipt of Notice to Award. The Schedule of Values should include the general categories noted in the Bid Schedule; however, broad categories may be subdivided into their various components. The Schedule of Values will be used to facilitate Progress Payments; therefore, any subdivision of work should be reflected as easily identifiable and measurable units. Final acceptance of the Schedule of Values will be at the discretion of the Construction Manager and/or Owner.

B. Format: Submit typed schedule based upon the attached Schedule of Values augmented by the Table of Contents of this Project Manual. Identify each line item with number and title of the major specification Section.

C. Include in each line item, the amount of Allowances specified in this Section.

D. Include within each line item, a directly proportional amount of Contractor's overhead and profit.

E. Revise schedule to list approved Change Orders, on continuation sheet, with each Application For Payment.

1.3 APPLICATIONS FOR PAYMENT

A. Submit application for Payment on AIA Form G702 - Application and Certificate for Payment and AIA Form G703 Continuation Sheet.

B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

C. Payment Application Times: The date for each progress payment is indicated in the General Conditions of the Contract.

D. Payment Application Periods: The period of construction covered by each application for payment is the period indicated in the General Conditions of the Contract.

E. Application Preparation: Complete every entry on form. Execute by a person authorized to sign legal documents. Construction manager, if applicable, and/or Architect will return incomplete applications without action.

F. Applications for Payment

1. Certified Payroll: Contractor shall register with the Department of Industrial Relations (DIR) and provide information requested by the DIR.

2. As-Built Records: Contractor shall maintain on the site a complete “As-Built” record set of the drawings, to be updated monthly and reviewed for accuracy with the Construction Manager (CM) as a condition of submitting the monthly application for payment. As-built records shall be of sufficient detail to describe as-constructed conditions and be in a format approved by the CM. They shall be submitted to the CM as requested.

3. Submit an updated Construction Schedule with Application for Payment. Refer to Section 01 32 00.

4. Submit Construction and Demolition (C&D) Waste Management Progress Report with each Application for Payment. Refer to Section 01 74 19, if applicable.

5. Submit Chain-of-Custody Certificates for Forest Stewardship Council (FSC) certified wood products. Refer to Sections in Division 6, if applicable.

G. Waiver of Stop Notices: With each application for payment, submit waivers of stop notices from subcontractors for construction period covered by the application. All releases shall cover portion of work to date for which application is made.

1. Conditional Releases shall be provided for current pay period.

2. Unconditional Releases shall be provided for past pay periods upon verification of payment made.

H. LEED Progress Reports: With each application for payment, submit LEED action plans as specified in Section 01 81 13.

I. Final Payment: As specified in the General Conditions of the Contract and in Section 01 77 00 - Closeout Procedures.

J. Refer to the General Conditions of the Contract for additional payment provisions.

1.4 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of the Architect, it is not practical to remove and replace the Work, the Architect will direct one of the following remedies:

1. The defective Work may remain, but the listed schedule of value will be adjusted to a new value at the discretion of the Architect.

2. The defective Work will be partially repaired to the instructions and satisfaction of the Architect and the listed schedule of value will be adjusted to reflect a new value at the discretion of the Architect.

1.5 NON-PAYMENT FOR REJECTED WORK

A. Payment will not be made for any of the following:

1. Products wasted or disposed of in a manner that is not acceptable.

2. Products determined to be unacceptable before or after placement.

3. Products not completely unloaded from the transporting vehicle.

4. Products placed beyond the lines and levels of the required work.

5. Products remaining on hand after completion of the work.

6. Loading, hauling and disposing of rejected products.

1.6 CHANGE PROCEDURES

A. The Architect will advise of minor changes in the Work not involving an adjustment to Contract Sum/Price or Contract Time as authorized by General Conditions on AIA Form G710 Architect's Supplemental Instructions.

B. The Architect may issue a Proposal Request which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications. Proposal Requests are for information only and are not to be considered instructions to stop the work or to execute the proposed change. Contractor will prepare and submit a detailed estimate within 14 days.

C. Any change in the Work which involves the adjustment to contract sum/price or contract time shall be properly certified by the Contractor as indicated in the General Conditions of the contract.

D. The Contractor may propose a change by submitting a Change Order Request to the Architect, describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors.

E. Stipulated Sum Change Order: Based on Proposal Request and Contractor's fixed price quotation or Contractor's Change Order Request as approved by Architect.

F. Construction Change Directive: Architect may issue a directive, signed by the Owner and Architect, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum or Contract Time. Promptly execute the change.

G. Change Order Forms: AIA G701 Change Order.

H. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the General Conditions of the Contract.

I. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

J. Promptly revise progress schedules to reflect any changes in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change and resubmit.

K. Promptly enter changes in Project Record Documents.

L. Change Order Timing Requirement: Upon first recognition of any condition that the Contractor believes may constitute a change to the Contract Documents- including additional work, discrepancies, omissions, field conditions, or any circumstances that may affect the Contract Sum or Contract Time- the Contractor shall promptly notify the Owner and Architect in writing within five (5) calendar days. Such notice shall include a description of the condition, the basis for asserting that it constitutes a change, and a preliminary statement of any anticipated cost or time impact. Within ten (10) calendar days following this notice, the Contractor shall submit a complete Change Order Request (COR) that fully defines the scope of the proposed change and includes an itemized cost breakdown, any claimed Contract Time impact, identification of effects on other work, and all supporting documentation necessary for evaluation. The Contractor shall not proceed with any changed work unless authorized in writing by an executed Change Order or Construction Change Directive. Work performed without prior written authorization shall be undertaken at the Contractor’s sole risk and shall not be eligible for additional compensation or time. No Change Order Requests will be considered if submitted after completion of the affected work or more than twenty (20) calendar days after the Contractor first encountered the condition, whichever occurs first, and failure to comply with these requirements shall constitute a waiver of entitlement.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

This is a sample illustration:

Item No.	Description of Work	Scheduled Value	Work Completed		Stored Materials	Total Completed	%	Balance To Finish	Retainage
			Previous App.	This App.					
	Div. 1 - General Reqs. Site Work General Conditions Supervision Mobilization Bonds & Insurance Permits Contractor's Fee Closeout Documents								
	Div. 1 - Total								
	Div. 2 - Existing Conditions Demolition (As applicable) Erosion Control **Div. 2 - Total**								
	Div. 3 - Concrete Drill Piers Caps & Beams Slab on Grade Cooling Tower Basin Misc Bldg Conc Floor Sealer Rebar Matl Rebar Labor Lt.Wt.Insul Fill - Materials Lt.Wt.Insul Fill - Labor Submittals/Closeout Documents Supervision Clean-up								
	Div. 3 - Total **Div 4 - Masonry** Brickwork - Labor Brickwork - Matls Concrete Masonry - Labor Concrete Masonry - Materials Str. Glazed Tile-Labor Str. Glazed Tile-Materials Submittals/Closeout Documents Supervision Clean-up								
	Div. 4 - Total								
	Div 5 - Metals Structural Steel - Labor Structural Steel - Materials Alternating Stairs Misc. Steel - Materials Steel Joists - Materials Lt. Gauge Steel Framing-Labor Lt. Gauge Steel Framing-Matls Metal Decking - Labor Expansion Joint Covers								

Item No.	Description of Work	Scheduled Value	Work Completed		Stored Materials	Total Completed	%	Balance To Finish	Retainage
			Previous App.	This App.					
	Detailing Submittals/Closeout Documents Supervision Clean-up								
	Div. 5 - Total								
	Div. 6 - Wood & Plastics Rough Carpentry - Labor Rough Carpentry - Materials Millwork - Labor Millwork - Materials Submittals/Closeout Documents								
	Div. 6 - Total								
	Div. 7 - Thermal and Moisture Protection Waterpfng / Dampprfng-Matls Waterpfng / Dampprfng-Labor Building Insulation - Labor Building Insulation - Materials Fireproofing - Labor Fireproofing - Materials Metal Roof - Labor Metal Roof - Materials Metal Roof Guarantee Built-up Roofing-Labor Built-up Roofing-Materials Built-up Roofing Guarantee Roof Accessories Building Sheet Metal - Labor Building Sheet Metal - Matls Bldg. Sheet Metal Guarantee Roof Curbs Roof Hatches Sealants Submittals/Closeout Documents Supervision Clean-up								
	Div. 7 - Total **Div. 8 - Doors and Frames** Finish Carpentry/Door - Labor Finish Hardware - Matls Thresholds & Seals - Matls+B66 Hollow Metal Doors & Frames - Matls Plastic Faced Doors-Matls Overhead Doors & Grilles-Labor Overhead Doors & Grilles - Matls Alum. Entrances & Store-fronts - Labor								

Item No.	Description of Work	Scheduled Value	Work Completed		Stored Materials	Total Completed	%	Balance To Finish	Retainage
			Previous App.	This App.					
	fronts - Matls Alum. Windows - Labor Alum Windows - Matls Glass & Glazing-Labor Glass & Glazing-Matls Submittals/Closeout Documents Supervision Clean-up								
	Div. 8 - Total								
	Div. 9 - Finishes Lath & Plaster-Labor Lath & Plaster-Matls Gypsum Wallboard Systems - Labor Gypsum Wallboard Systems - Matls Ceramic Tile - Labor Ceramic Tile - Matls Quarry Tile - Labor Quarry Tile - Matls Terrazzo-Labor Terrazzo-Matls Acoustic Clg. - Labor Acoustic Clg. - Matls Acoustic Wall Panels Resilient Flooring - Labor Resilient Flooring - Matls Carpet - Labor Carpet - Matls Athletic Flooring - Materials Athletic Flooring - Labor Floor Sealer Painting - Labor Painting - Mtls Submittals/Closeout Documents Supervision Clean-up								
	Div. 9 - Total								
	Div. 10 - Specialties Visual Display Boards & Tackboards - Materials Visual Display Boards & Tackboards - Labor Toilet Partitions - Labor Toilet Partitions - Matls Louvers Aluminum Flag Pole Graphics Lockers Cubicle Curtains & Track Fire Extinguisher Cabinets Demountable Partitions-Labor								

Item No.	Description of Work	Scheduled Value	Work Completed		Stored Materials	Total Completed	%	Balance To Finish	Retainage
			Previous App.	This App.					
	Demountable Partitions-Matls Shelving Toilet Room Accessories-Matls Toilet Room Accessories-Lbr Submittals/Closeout Documents Supervision Clean-up								
	Div. 10 - Total								
	Div. 11 - Equipment Stage Curtains Misc. Appliances Food Service Eqpt-Labor Food Service Eqpt-Matls Submittals/Closeout Documents Supervision Clean-up								
	Div. 11 - Total								
	Div. 12 - Furnishings Horizontal Blinds Projection Screens Casework - Labor Casework - Matls Science Casework - Labor Science Casework - Matls Submittals/Closeout Documents Supervision Clean-up								
	Div. 12 - Total								
	Div. 13 - Specialties Stage Curtains and Draperies Music Instrument Storage Bleachers Press Box Pre-eng. Metal Bldg. Stadium Seating Submittals/Closeout Documents Supervision Clean-up								
	Div. 13 - Total								
	Div. 14 - Conveying Systems Platform Lifts Elevators Submittals/Closeout Documents Supervision Clean-up								
	Div. 14 - Total								
	Div. 21, 22 - Plumbing Shop Drawings As-Builts/Closeout/ O&M Manuals Sanitary Underground – Labor								

Item No.	Description of Work	Scheduled Value	Work Completed Previous App.	Work Completed This App.	Stored Materials	Total Completed	%	Balance To Finish	Retainage
	Sanitary Underground - Matls Storm Underground - Labor Storm Underground - Matls Domestic Water - Labor Domestic Water - Matls Plumbing Insulation - Matls Plumbing Insulation - Labor Gas Piping - Matls Gas Piping - Labor Grease Trap Plumbing Fixtures - Matls Plumbing Fixtures - Labor Coordination Drawings Submittals/Closeout Documents Supervision Clean-up								
	Div. 21, 22 Plumbing - Total								
	Div. 23 - Mechanical Shop Drawings As-Builts/Closeout/ O&M Manuals Chillers - Matls Chillers - Labor Cooling Towers - Matls Cooling Towers - Labor Boilers - Matls Boilers - Labor AHU's - Matls AHU's - Labor Fans - Matls Fans - Labor Grilles - Matls Grilles - Labor Ductwork - Matls Ductwork - Labor Pumps - Mtls Pumps - Labor Water Treatment - Labor Water Treatment - Matls Isolation - Labor Isolation - Matls Pipe Flex - Matls Pipe Flex - Labor Connections Sheet Metal - Matls Sheet Metal - Labor Duct Insulation - Matls Duct Insulation - Labor								

Item No.	Description of Work	Scheduled Value	Work Completed		Stored Materials	Total Completed	%	Balance To Finish	Retainage
			Previous App.	This App.					
	Pipe Insulation - Matls								
	Pipe Insulation - Labor								
	VAV Boxes - Materials								
	VAV Boxes - Labor								
	Refrigerant Monitor - Matls								
	Refrigerant Monitor - Labor								
	Unit Heaters - Materials								
	Unit Heaters - Labor								
	Startup								
	Controls - Matls								
	Control - Labor								
	Engineer / Submittals								
	Modules / End Devices								
	Low Voltage Wiring								
	Startup								
	Closeout Documents								
	Fire Sprinkler								
	Engineer / Submittals								
	Piping - Materials								
	Piping - Labor								
	Equipment - Materials								
	Equipment - Labor								
	Trimout - Materials								
	Trimout - Labor								
	Pipe, Valves, Fittings - Labor								
	Pipe, Valves, Fittings - Matls								
	Misc. - Matls								
	Insulation - Matls								
	Insulation - Labor								
	Sanitary Above Slab-Labor								
	Sanitary Above Slab-Matls								
	Storm Above Slab - Labor								
	Storm Above Slab - Matls								
	Gas - Labor								
	Gas - Matls								
	Fixtures - Labor								
	Fixtures - Matls								
	Permits								
	Coordination Drawings								
	Submittals/Closeout Documents								
	Supervision Clean-up								
	Div. 23 Mechanical - Total								
	Div. 26 - Electrical								
	Mobilization+B220								
	Shop Drawings								
	As-Builts/Closeout/ O&M Manuals								
	Underground								
	Conduit - Labor								
	Conduit - Matl								
	Wire - Labor								

Item No.	Description of Work	Scheduled Value	Work Completed		Stored Materials	Total Completed	%	Balance To Finish	Retainage
			Previous App.	This App.					
	Wire - Matls								
	Feeder Wire - Labor								
	Feeder Wire - Matls								
	Switches/Recpt.								
	Switchgear - Labor								
	Switchgear - Matls								
	Temporary - Materials								
	Temporary - Labor								
	Gas Generator - Materials								
	Gas Generator - Labor								
	Fixtures - Labor								
	Fixtures - Matls								
	Communications - Labor								
	Communications - Matls								
	Fire Alarm - Labor								
	Fire Alarm - Matls								
	Security - Labor								
	Security - Matls								
	Low Voltage Ltng Sys-Matls								
	Low Voltage Ltng Sys-Labor								
	Voice System - Materials								
	Voice System - Labor								
	Video System - Materials								
	Video System - Labor								
	Data System - Materials								
	Data System - Labor								
	Master Clock - Materials								
	Master Clock - Labor+B277								
	Coordination Drawings								
	Submittals/Closeout Documents								
	Supervision Clean-up								
	Div. 26 - Total								
	Divs. 31, 32 and 33 - Earthwork, Exterior Improvements and Utilities								
	Site Clearing & Grubbing								
	Building Pad - Materials								
	Building Pad - Labor								
	Paving Subgrade								
	Signage / Striping								
	Bike Racks								
	Landscaping - Materials								
	Landscaping - Labor								
	Hydro Mulch - Materials								
	Hydro Mulch - Labor								
	Irrigation - Materials								
	Irrigation - Labor								
	Earthwork								
	Finish Grading								
	Stabilization - Materials								
	Stabilization - Labor								
	Site Drainage - Materials								
	Site Drainage - Labor								

Item No.	Description of Work	Scheduled Value	Work Completed		Stored Materials	Total Completed	%	Balance To Finish	Retainage
			Previous App.	This App.					
	Chain Link Fence-Materials Chain Link Fence-Labor Paving - Labor Paving - Materials Sidewalks Submittals/Closeout Documents Supervision Clean-up								
	Div. 31, 32 and 33 - Total								
	General Conditions Mobilization Temp. Facilities Final Cleaning Record Documents/Closeout/ O&M Manuals Supervision Permits Bonds Insurance Allowances Alternates (list) Change Orders A. PR# B. PR# C. PR#								

SECTION 01 25 13

PRODUCT SUBSTITUTION PROCEDURES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Product options.

B. Substitution procedures.

1.2 DEFINITIONS

A. 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. The following are not considered substitutions:

1. Revisions to Contract Documents requested by the Owner or Architect.

2. Specified options of products, materials, and equipment included in Contract Documents.

1.3 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers with Provision for Substitution: Products of manufacturers named and meeting specifications with substitution of products or manufacturer only when submitted under provisions of this section.

C. Products Specified by Naming One or More Manufacturers without Provision for Substitution: No substitution allowed.

1.4 LIMITATIONS ON SUBSTITUTIONS SUBMITTED PRIOR TO THE RECEIPT OF BIDS

A. 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.

B. The opportunity to request a substitution is not for the convenience of the Bidder to request acceptance of equipment and/or materials which may be more familiar or have a lesser cost.

C. Architect may consider requests for substitutions of specified equipment and/or materials only when requests are received by the Architect (7) seven days prior to the date established for the receipt of bids as stipulated in the Instructions to Bidders.

D. Consideration by Architect of a substitution request will be made only if request is made in strict conformance with provisions of this section.

E. Burden of proof of merit of requested substitution is the responsibility of the entity requesting the substitution.

F. It is the sole responsibility of the entity requesting the substitution to establish proper content of submittal for requests for substitutions. Incomplete submittals will be rejected.

G. Architect's decision on substitution requests are final and do not require documentation or justification.

H. When substitution is not accepted, provide specified product.

I. Substitute products shall not be included within the bid without written acceptance by Addendum.

1.5 LIMITATIONS ON SUBSTITUTIONS SUBMITTED AFTER THE AWARD OF THE CONTRACT

A. The Contract is based upon the standards of quality established by those items of equipment and/or materials which are specifically identified in the Contract Documents.

B. The opportunity to request a substitution is not for the convenience of the Contractor to request acceptance of equipment and/or materials which may be more familiar or have a lesser cost.

C. Consideration by Architect of substitution requests received after the established date of the receipt of bids or contract award will only be made when one or more of the following conditions are met and documented:

1. Specified item fails to comply with regulatory requirements.

2. Specified item has been discontinued.

3. Specified item, through no fault of the Contractor, is unavailable in the time frame required to meet project schedule.

4. Specified item, through subsequent information disclosure, will not perform properly or fit in designated space.

5. Manufacturer declares specified product to be unsuitable for use intended or refuses to warrant installation of product.

6. Substitution would be, in the sole judgement of the Architect, a substantial benefit to the Owner in terms of cost, time, energy conservation, or other consideration of merit.

D. Notwithstanding the provisions of Article 1.4 of this section and the above, the Architect may consider a substitution request after the date of the receipt of bids or contract award, if in the sole discretion of the Architect, there appears to be just cause for such a request. The acceptance of such a late request does not waive any other requirement as stated herein.

E. Consideration by Architect of a substitution request will be made only if request is made in strict conformance with provisions of this section.

F. Substitutions will not be considered when they are indicated or implied on shop drawings or product data submittals without separate written request as required by provisions of this section.

G. Review of shop drawings does not constitute acceptance of substitutions indicated or implied on shop drawings.

H. Substitutions will not be considered when requested or submitted directly by subcontractor or supplier.

I. Substitutions will not be considered as a result of the failure to pursue the work promptly or coordinate activities properly.

J. Burden of proof of merit of requested substitution is the responsibility of the Contractor.

K. It is the sole responsibility of the Contractor to establish proper content of submittal for requests for substitutions. Incomplete submittals will be rejected.

L. Owner shall receive full benefit of any cost reduction as a result of any request for substitution.

M. Architect's decision on substitution requests is final and does not require documentation or justification.

N. When substitution is not accepted, provide specified product.

O. Substitute products shall not be ordered or installed without written acceptance.

1.6 REGULATORY REQUIREMENTS

A. It shall be the responsibility of the entity requesting the substitution to obtain all regulatory approvals required for proposed substitutions.

B. All regulatory approvals shall be obtained for proposed substitutions prior to submittal of substitution request to Architect.

C. All costs incurred by the Owner 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 Owner. Costs of these services shall be reimbursed regardless of final acceptance or rejection of substitution.

1.7 SUBSTITUTION REPRESENTATION

A. In submitting a request for substitution, the entity requesting the substitution makes the representation that he or she:

1. Has investigated the proposed substitution and has determined that it meets or exceeds the quality level of the specified product.

2. Will provide the same warranty or guarantee for the substitution as for the specified product.

3. 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 Owner.

4. Waives claims for additional cost or time extension which may subsequently become apparent.

5. Will reimburse Owner for the cost of Architect's review or redesign services associated with substitution request.

1.8 SUBMITTAL PROCEDURE

A. Submit each Substitution Request in conformance with the requirements of this section.

B. Assemble complete Substitution Request into a single bookmarked Portable Document Format (PDF) file.

C. Transmit electronic PDF files via Architect’s Project Collaboration Site address or designated email address.

D. Submit request with Architect's Substitution Request Form. Form may be obtained at the office of the Architect. Substitution requests received without request form will be returned unreviewed.

E. Limit each request to one proposed substitution.

F. Request to include sufficient data so that direct comparison of proposed substitution can be made.

G. Provide complete documentation for each request. Documentation shall include the following information, as appropriate, as a minimum:

1. Statement of cause for substitution request.

2. Identify product by specification section and article number.

3. Provide manufacturer's name, address, and phone number. List fabricators, suppliers, and installers as appropriate.

4. List similar projects where proposed substitution has been used, dates of installation and names of Architect and Owner.

5. List availability of maintenance services and replacement materials.

6. Documented or confirmation of regulatory approval.

7. Product data, including drawings and descriptions of products.

8. Fabrication and installation procedures.

9. Samples of proposed substitutions.

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.

11. Coordination information, including a list of changes or modifications needed to other items of work that will become necessary to accommodate proposed substitution.

12. Statement on the substitutions effect on the construction schedule.

13. Cost information including a proposal of the net change, if any, in the Contract sum if the substitution is submitted after the receipt of bids or contract award.

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.

15. Statement that substitution is in compliance with requirements needed to obtain LEED prerequisites and credits.

16. Waiver of right to additional payment or time that may subsequently become necessary because of failure of substitution to perform adequately.

H. 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 ARCHITECT'S REVIEW

A. Within 14 days of receipt of request for substitution, the Architect will accept or reject proposed substitution.

B. If a decision on a substitution cannot be made within the time allocated, the product specified shall be used.

C. There shall be no claim for additional time for review of proposed substitutions.

D. Final acceptance of a substitution submitted prior to the date established for the receipt of bids will be in the form of an Addendum.

E. Final acceptance of a substitution submitted after the award of the contract will be in the form of a Change Order.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coordination.

B. Coordination of Work Under Contract.

C. Full-Time Project Manager and Superintendence.

D. Preconstruction conference.

E. Progress meetings.

F. Request for Information (RFIs).

G. Preinstallation conferences.

H. Commissioning.

I. Closeout conference.

J. Post construction dedication.

1.2 DEFINITIONS

A. RFI - Request from Contractor seeking additional information, interpretation or clarification of the Contract Documents.

1.3 COORDINATION

A. Coordinate scheduling, submittals, and Work of the various Sections of Specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Coordinate construction operations of the different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work.

C. Prior to commencement of a particular type or kind of work examine relevant information, contract documents and subsequent data issued to the project.

D. 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.

E. 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.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. 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.

H. 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.

I. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owners occupancy.

J. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

K. Coordinate all utility company work in accordance with the General Conditions.

L. Coordinate field engineering with the provisions of Section 01 73 00.

1.4 COORDINATION OF WORK UNDER CONTRACT

A. Unless otherwise expressly stated in the Agreement between the Contractor and the City, the City of Costa Mesa Construction Manager (CM) retained by the City to manage construction activities at the project site and act as the City's designated representative, will be responsible for all written Contract communication after the issuance of Notice to Proceed (NTP) through final acceptance and release of retention. The CM shall coordinate with the A-E so that questions regarding the Drawings and Specifications can be resolved. Prior to commencement of the project, but after award of the contract, the Contractor must contact the Construction Manager to arrange for a pre-construction conference. All correspondence relating to this contract shall be between the Contractor and the Construction Manager.

B. Coordination: Contractor shall coordinate the Work as stated in the General and Special Provisions of the Contract. Contractor shall also coordinate Work under the Contract with work under separate contracts by City. All project correspondence shall be directed to the Construction Manager (CM) using the project specific cloud-based Contract Administration program specified by the City. Contractor and its major subcontractors are required to use the system and training will be provided prior to the issuance of the Notice to Proceed. Project correspondence includes, but is not limited to, the following:

1. Bulletins
2. Meeting Minutes
3. RFI's
4. Submittals
5. CPM Schedules
6. Daily Reports
7. Notices & Letters
8. Progress Payments

C. Relationship of Contract Documents: Drawings, Specifications and other Contract Documents in the Project Manual are intended to be complementary. What is required by one shall be as if required by all. What is shown or required, or may be reasonably inferred to be required, or which is usually and customarily provided for similar work, shall be included in the Work.

D. Discrepancies in Contract Documents: In the event of error, omission, ambiguity or conflict in Drawings or Specifications, Contractor shall bring the matter to the attention of the Construction Manager in a timely manner, for direction in accordance with provisions of the General and Special Provisions of the Contract.

E. Construction Interfacing and Coordination: Layout, scheduling and sequencing of Work shall be solely the Contractor's responsibility.

1. Contractor shall verify, confirm and coordinate field measurements so that new construction correctly and accurately interfaces with conditions existing prior to construction.

2. Contractor shall bring together the various parts, components, systems and assemblies as required for the correct interfacing and integration of all elements of Work. Contractor shall coordinate Work to correctly and accurately connect abutting, adjoining, overlapping and related elements, including work under separate contracts by City, utility agencies and companies.

1.5 FULL-TIME PROJECT MANAGER AND SUPERINTENDENCE

A. Project Manager and Superintendence Requirements:

1. The Contractor shall employ, at a minimum, a competent, Project Manager and Superintendent responsible for the proper coordination, documentation and construction of the work. The Project Manager and Superintendent must operate from the site. They may be assisted by others located off site. The Project Manager and Superintendent must be on-site whenever work is being done by the Contractor or his subcontractors. All such persons shall be acceptable to the City continuously throughout the duration of the project. The Project Manager and Superintendent must have the authority to bind the Contractor in all project decisions.

2. The Project Manager and Superintendent shall not be changed except with the approval of City of Costa Mesa, unless they prove to be unsatisfactory to Contractor and ceases to be in Contractor's employ, in which case the Project Manager and/or Superintendent shall be replaced within 24 hours by a Project Manager or Superintendent with specified qualifications and acceptable to City of Costa Mesa. On contracts under $50,000, Contractor may provide adequate supervision on the site (in lieu of full supervision) to assure effective progress and compliance with the Contract Documents.

3. The resumes of the Project Manager and Superintendent must be submitted to the City of Costa Mesa for acceptance prior to the issuance of the Notice to Proceed.

1.6 PRECONSTRUCTION CONFERENCE

A. Contractor to contact the Construction Manager, if applicable, or Architect to schedule a conference immediately after receipt of fully executed contract documents prior to project mobilization.

B. Mandatory Attendance: Owner, Owner's Inspector, Owner's Testing Laboratory Representative, Architect, Construction Manager, Contractor, Contractor's Project Manager and Contractor's Job Superintendent.

C. Optional Attendance: Architect's consultants, subcontractors and utility company representatives.

D. Construction Manager, if applicable, or Architect will preside at conference, record minutes and distribute copies.

E. Agenda:

1. Status of Owner-Contractor Agreement.

2. Status of Notice to Proceed.

3. Status of executed bonds and insurance certificates.

4. Federal and State labor law requirements applicable to Contract.

5. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.

6. Designation of responsible personnel representing the parties.

7. Procedures and processing of RFIs, field decisions, submittals, substitutions, applications for payments, proposal requests, Change Orders and Contract closeout procedures.

8. Procedures for testing and inspection.

9. Temporary facilities and controls.

10. Procedures for moisture and mold control.

11. Procedures for disruptions and shutdowns.

12. Scheduling.

13. Critical work sequence and long lead items.

14. Work restrictions and working hours.

15. Progress meetings.

16. Use of site.

17. Storage.

18. Authorities having jurisdiction over project.

19. Owner occupancy requirements.

20. Owner-Furnished equipment.

21. Separate contracts.

22. Commissioning.

23. LEED requirements.

24. Construction waste management.

25. SWPPP requirements.

26. Preparation of Record Drawings.

27. Security.

28. Parking availability.

29. Progress cleaning.

1.7 PROGRESS MEETINGS

A. When there is no Construction Manager involvement, Architect will schedule and administer meetings throughout progress of two week intervals.

B. When there is no Construction Manager involvement, Architect will make arrangements for meetings, prepare agenda, preside at meetings, record minutes (Field Reports), and distribute copies, unless otherwise specified.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Owner's Inspector, and Architect, as appropriate to agenda topics for each meeting.

D. Agenda:

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

2. Review of Work progress.

3. Field observations, problems, and decisions.

4. Identification of problems which impede planned progress.

5. Review of submittals schedule and status of submittals.

6. Requests For Information (RFIs).

7. Status of Proposal Requests (PRs).

8. Status of Change Order Requests (CORs).

9. Status of Change Orders (Cos).

10. Status of corrective or deficient items.

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

12. Maintenance of construction schedule.

13. Corrective measures to regain projected schedules.

14. Planned progress during succeeding work period.

15. Coordination of projected progress.

16. Maintenance of quality and work standards.

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

18. Temporary facilities and controls.

19. Progress cleaning.

20. Commissioning activities.

21. Other business relating to Work.

22. Construction waste management.

23. SWPP requirements.

24. Preparation of Record Drawings.

25. Security.

26. Parking availability.

1.8 REQUEST FOR INFORMATION (RFI'S)

A. Procedure: Immediately on discovery of the need for additional information, interpretation of the Contract Documents, and if not possible to request interpretation at Progress Meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.

2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

3. Each RFI shall address only one subject matter.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Date.

2. Project name.

3. Owner’s name.

4. Name of Construction Manager

5. Name of Contractor.

6. Name of Architect.

7. RFI number, numbered sequentially.

8. Specification Section number and title and related paragraphs, as appropriate.

9. Drawing number and detail references, as appropriate.

10. Field dimensions and conditions, as appropriate.

11. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.

12. Contractor's signature.

13. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Hard-Copy RFIs: Identify each page of attachments with the RFI number and sequential page number.

D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above. Attachments shall be electronic files in a format that will allow electronic editing by the Architect.

E. Architect's Action: After receiving the RFI from the Construction Manager, if applicable, the Architect will review each RFI, determine action required, and return it. Allow fifteen days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day. If the RFI is required to be forwarded to a consultant, subconsultant, or Owner for a response, the response time will be twenty five days.

1. The following RFIs will be returned without action:

(a) Requests for approval of submittals.

(b) Requests for approval of substitutions.

(c) Requests for information already indicated in the Contract Documents.

(d) Requests for coordination information which is the responsibility of the Contractor.

(e) Requests for adjustments in the Contract Time or the Contract Sum.

(f) Requests for interpretation of Architect's actions on submittals and substitutions.

(g) Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's allowable time for response will start again.

3. Architect’s review of or response to RFIs shall not constitute an approval, direction, or procedure related to construction means, methods, techniques, sequences, or procedures of Contractor.

4. Architect’s review of or response to RFIs shall not constitute an approval, direction, or procedure related to the construction site safety precautions, procedures or methodology of Contractor.

5. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Order Request according to Division 01 Section 01 20 00 - Price and Payment Procedures.

(a) If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify the Construction Manager, if applicable, and Architect in writing within five days of receipt of the RFI response.

(b) Under no circumstances is the Architect’s review of or response to RFIs to be considered an authorization to depart from the Contract Documents or an authorization to perform extra work.

F. The Architect will send their RFI response directly to the Construction Manager, if applicable. On receipt of Architect's action immediately distribute the RFI response to affected parties.

G. Review response and notify Architect within three days if Contractor disagrees with response.

1.9 COMMISSIONING

A. This project will have selected building systems commissioned.

B. The equipment and systems to be commissioned are specified in Section 01 91 13 - General Commissioning Requirements.

C. The commissioning process will be directed by a commissioning authority whose services will be provided by the Architect.

1.10 PREINSTALLATION CONFERENCES

A. When required in individual specification Section, convene a preinstallation conference prior to commencing work of the Section. Refer to individual specification section for timing requirements of conference.

B. Require attendance of parties directly affecting, or affected by, work of the specific Section.

C. Notify the Construction Manager, if applicable, and the Architect a minimum of seven days in advance of meeting date.

D. Preinstallation conference to coincide with regularly scheduled progress meeting.

E. Prepare agenda, preside at conference, record minutes, and distribute copies within two days after conference to participants.

F. Agenda:

1. Review of Contract Documents.
2. Manufacturer's recommendations.
3. Status of submittals.
4. Related RFIs.
5. Related Change Orders.
6. Schedule of work activities.
7. Deliveries of materials and equipment.
8. Sequence of operation.
9. Acceptable substrates.
10. Interface requirements.
11. Possible conflicts.
12. Access.
13. Site utilization.
14. Tests and inspections.
15. Review of Mockups.
16. Temporary facilities and controls.
17. Quality and work standards.
18. Weather limitations.

1.11 PROJECT CLOSEOUT CONFERENCE

A. Architect will schedule a project closeout conference, at a time convenient to Owner and Contractor, but no later than 90 days prior to the scheduled date of Substantial Completion.

B. Mandatory Attendance: Owner, Owner’s Inspector, Owner’s Testing Laboratory, Architect, and Contractor.

C. Architect will preside at conference, record minutes, and distribute copies.

D. Refer to Section 01 77 00 for additional closeout requirements.

E. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

1. Submittal procedures for closeout documents.

2. Preparation of Record Documents.

3. Procedures required prior to review for Substantial Completion and for final review for acceptance.

4. Submittal of written warranties.

5. Requirements for completing sustainable design documentation.

6. Procedures for completing the Commissioning process.

7. Requirements for preparing operations and maintenance data.

8. Requirements for delivery of material samples, attic stock, and spare parts.

9. Requirements for demonstration and training.

10. Preparation of Contractor's punch list.

11. Procedures for processing Applications for Payment at Substantial Completion and for final payment.

12. Coordination of separate contracts.

13. Owner's partial occupancy requirements.

14. Installation of Owner's furniture, fixtures, and equipment.

15. Responsibility for removing temporary facilities and controls.

1.12 POST CONSTRUCTION DEDICATION

A. Attendance Required: Project superintendent, project manager, major subcontractors, Owner and Architect.

B. Preparation prior to Dedication:

1. Assist Owner in operation of mechanical systems.

2. Verify operation and adjust controls for communication systems.

3. Assist Owner in operation of lighting systems.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.

2. Contractor's Construction Schedule.

3. Construction schedule updating reports.

4. Daily construction reports.

5. Material location reports.

6. Site condition reports.

7. Special reports.

1.3 DEFINITIONS

A. Activity:

1. A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources:

a. Critical activity: An activity on the critical path that must start and finish on the planned early start and finish times.

b. Predecessor activity: An activity that precedes another activity in the network.

c. Successor activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of the project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Float:

1. The measure of leeway in starting and completing an activity:

a. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

b. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

c. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Look-ahead Schedule: Schedule indicating activities scheduled to occur or commence prior to submittal of next schedule update.

G. Milestones: Measurable, observable, and serve as progress markers (flags) but, by definition, are independent of time (have zero durations); therefore, no Work or consumption of resources is associated with them.

H. Recovery Schedule: Submittal of a revised CPM schedule and a written plan.

I. Resource Loading: The allocation of manpower and equipment necessary for completion of an activity as scheduled.

1.4 SUBMITTALS

A. Submittal Format:

1. Submit required submittals in the following format:

a. Working electronic copy of schedule file, where indicated.

b. PDF electronic file.

B. Startup Diagram: Of size necessary to display entire network for entire construction period. Show logic relationship ties for all activities.

C. Contractor's Construction Schedule:

1. Initial schedule, of size required to display entire schedule for entire construction period:

a. Submit a working electronic copy of schedule labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

D. CPM Reports:

1. Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days:

a. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.

b. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.

c. Total Float Report: List of all activities sorted in ascending order of total float.

d. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

E. Construction Schedule Updating Reports: Submit with Applications for Payment.

F. Daily Construction Reports: Submit at monthly intervals.

G. Material Location Reports: Submit at monthly intervals.

H. Site Condition Reports: Submit at time of discovery of differing conditions.

I. Special Reports: Submit at time of unusual event.

1.5 QUALITY ASSURANCE

A. Pre-Scheduling Conference:

1. Conduct conference at site. Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:

a. Review software limitations and content and format for reports.

b. Verify availability of qualified personnel needed to develop and update schedule.

c. Discuss constraints, including phasing, Work stages, area separations, interim milestones, and partial Owner occupancy.

d. Review delivery dates for Owner furnished products.

e. Review schedule for work of Owner's separate contracts, if any.

f. Review submittal requirements and procedures.

g. Review time required for review of submittals and resubmittals.

h. Review requirements for tests and inspections by independent testing and inspecting agencies.

i. Review time required for Project closeout and Owner startup procedures.

j. Review and finalize list of construction activities to be included in schedule.

k. Review procedures for updating schedule.

B. Coordination:

1. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports:

a. Secure time commitments for performing critical elements of the Work from entities involved.

b. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

2 PART 2 PRODUCTS

(NOT USED)

3 PART 3 EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Time is of the essence to Owner. Commence Work immediately upon issuance of the Notice to Proceed. There is a critical need for the Work to be substantially complete within the time frame identified in the Agreement.

B. Time Frame:

1. Extend schedule from date established for commencement of the Work to date of Substantial Completion and date of final completion:

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

C. Activities:

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

a. Activity duration: Define activities in terms of number of days anticipated.

b. Procurement activities: Include procurement process activities for long lead items and major items requiring a cycle of more than 60 days as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

c. Submittal review time: Include review and resubmittal times indicated in Section 01 33 00: Submittal Procedures in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.

d. Startup and testing time: Include number of days anticipated for startup and testing.

e. Substantial Completion: Indicate completion of all conditions as in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

f. Punch list and final completion: Include a maximum of 30 days for completion of punch list items and final completion.

g. Inspections required by Authorities Having Jurisdiction (AHJ).

D. Constraints:

1. Include constraints and Work restrictions indicated in the Contract Documents and show how the sequence of the Work is affected:

a. Work restrictions:

1) Show the effect of the following items on the schedule:

a) Coordination with existing construction.

b) Limitations of continued occupancies.

c) Uninterruptible services.

d) Partial occupancy before Substantial Completion.

e) Use of premises restrictions.

f) Provisions for future construction.

g) Seasonal variations.

h) Environmental control.

i) Rain days.

b. Work stages:

1) Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

a) Submittals.

b) Mockups.

c) Fabrication.

d) Installation.

e) Tests and inspections.

f) Adjusting.

g) Curing.

E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

F. Six (6) Week Look-Ahead Schedule:

1. Prepare schedule indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

a. Unresolved issues.

b. Unanswered Requests for Information.

c. Rejected or unreturned submittals.

d. Notations on returned submittals.

e. Pending modifications affecting the Work and Contract Time.

f. Inspections by AHJ.

g. Trade pre-installation conference.

G. Recovery Schedule: When periodic update indicates the Work is 10 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

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

I. Contract Modifications: For each proposed Contract modification and concurrent with its submission, prepare a time impact analysis to demonstrate the effect of the proposed change on the overall Project schedule.

J. Schedule Updating:

1. Concurrent with making revisions to the schedule, prepare tabulated reports showing the following:

a. Identification of activities that have changed.

b. Changes in early and late start dates.

c. Changes in early and late finish dates.

d. Changes in activity durations in workdays.

e. Changes in the critical path.

f. Changes in total float or slack time.

g. Changes in Contract Time.

3.2 REPORTS

A. Daily Construction Reports:

1. Prepare a daily construction report recording information concerning events at the site and submit each month to Architect:

a. List of subcontractors at the Project site.

b. List of separate contractors at the Project site.

c. Approximate count of personnel at the Project site.

d. Rental equipment at the Project site.

e. Material deliveries.

f. High and low temperatures and general weather conditions, including presence of rain or snow.

g. Accidents.

h. Meetings and significant decisions.

i. Unusual events (see special reports).

j. Stoppages, delays, shortages, and losses.

k. Meter readings and similar recordings.

l. Emergency procedures.

m. Orders and requests of AHJ.

n. Change Orders received and implemented.

o. Construction Change Directives received and implemented.

p. Services connected and disconnected.

q. Equipment or system tests and startups.

r. Partial completions and occupancies.

s. Substantial Completions authorized.

t. Photographs.

B. Material Location Reports:

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

a. Material stored prior to previous report and remaining in storage.

b. Material stored prior to previous report and since removed from storage and installed.

c. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report and contact Architect’s field representative. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents to Architect’s field representative.

D. Special Reports:

1. Submit special reports directly to Owner within 24 hours of an occurrence. Distribute copies of report to parties affected by the occurrence:

a. Reporting unusual events: When an event of an unusual and significant nature occurs at site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, and response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner and Architect in advance when these events are known or predictable.

3.3 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating:

1. At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule with a pencil copy of pay application:

a. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

b. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

c. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution:

1. Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and interested parties identified by Contractor with a need-to-know schedule responsibility:

a. Post copies in Project meeting rooms and temporary field offices.

b. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.4 TIME IMPACT ANALYSIS (TIA)A

A. A prospective, logic-based critical path analysis prepared and submitted by the Contractor to demonstrate the actual time effect of a specific delay event on the Project's then-current critical path.

1. The Contractor shall bear the burden of proving, through a properly prepared TIA that:

a. The alleged delay event was excusable under the Contract;

b. The delay was not caused or contributed to by the Contractor or its subcontractors;

c. The delay affected activities then on the Project's critical path;

d. The delay exhausted all available float, which is jointly owned Project resource;

e. The delay resulted in a net extension to the Contract completion date.

2. Any TIA that fails to meet these requirements, or that is not supported contemporaneous schedule updates and project records, shall be rejected and shall not entitle the Contractor to a time extension or additional compensation.

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Related submittals.

B. Architect's digital data files.

C. Processing time.

D. Submittal review.

E. Submittal procedures - paper submittals.

F. Shop drawings - paper submittals.

G. Submittal procedures - electronic submittals.

H. Shop drawings - electronic submittals.

I. Product data.

J. Samples.

K. Manufacturers' instructions.

L. Manufacturers' certificates.

M. Deferred approval requirements.

N. Submittal schedule.

1.2 RELATED SUBMITTALS

A. Progress Payments: Section 01 20 00 - Price and Payment Procedures.

B. Schedule of Values: Section 01 20 00 - Price and Payment Procedures.

C. Substitutions: Section 01 25 13 – Product Substitution Procedures.

D. Coordination Drawings: Section 01 31 00 - Project Management and Coordination.

E. Construction Schedule: Section 01 32 00 – Construction Progress Documentation

F. Tests and Inspections: Section 01 45 29 – Testing Laboratory Services.

G. Certified Final Property Survey: Section 01 73 00 – Execution Requirements.

H. Waste Reduction Progress Reports: Section 01 74 19 - Construction Waste Management and Disposal.

I. Closeout Procedures: Section 01 77 00 – Closeout Procedures.

J. LEED Submittals: Section 01 81 13 – Sustainable Design Requirements.

K. Commissioning Submittals: Section 01 91 13 - General Commissioning Requirements.

L. The General Conditions set forth additional requirements for submittals.

1.3 ARCHITECT'S DIGITAL DATA FILES

A. Upon written request, the Architect’s electronic CAD files will be provided for use in connection with preparation of shop drawings subject to the acceptance of the Architect’s standard terms and conditions for electronic file transfer.

1.4 PROCESSING TIME

A. Priority, long-lead, deferred approval, etc., submittals shall be submitted to the Architect within 30 days after the Notice-of Award, before the Notice to Proceed will be issued.

B. Time period for review of submittals will commence upon receipt of submittal by Architect.

C. Initial Review: Allow ten working days for each submittal.

D. Resubmittal Review: Allow ten working days for each resubmittal.

E. Sequential Review: Allow fifteen working days for initial and resubmittal review of each submittal where review is required by Architect’s consultant’s, Owner or other parties indicated.

F. Deferred Approval Review: Allow a minimum of sixty calendar days for each submittal and any subsequent resubmittal review by the governing jurisdiction.

G. Deferred Approval Review (Temporary Living Quarters): Submit within 30 days following the specified Notice to Proceed (NTP).

H. Traffic Control Plan Review: Allow twenty working days for initial and resubmittal review.

1.5 SUBMITTAL REVIEW

A. The Architect’s review is only for general conformance with design concept and Contract requirements. Contractor is responsible for compliance with Contract Documents, dimensions, quantities, fit and coordination with other Work. Review does not authorize substitutions, exclusions and limitations to Contract requirements unless specifically requested by Contractor and acknowledged by Architect.

B. Definitions for submittal review:

1. Review Completed - Do Not Resubmit: The Work covered by the submittal has been reviewed by the Architect and may proceed provided it complies with the Contract Documents. Final acceptance will depend on that compliance.

2. Revise as Noted - Do Not Resubmit: The Work covered by the submittal has been reviewed by the Architect and may proceed provided it complies both with Architect's notations and corrections on the submittal and the Contract Documents. Final acceptance will depend on that compliance.

3. Revise as Noted - Resubmit for Record: The Work covered by the submittal has been reviewed by the Architect and the submittal is to be revised according to the Architect's notations and corrections and a new submittal is to be made. Do not proceed with the Work covered by the submittal. Once the revised submittal is received it will be reviewed again by the Architect and retained as the record submittal. Once reviewed, the Work may proceed provided it complies with the Contract Documents. Final acceptance will depend on that compliance.

4. Not Acceptable - Make New Submittal: Do not proceed with the Work covered by the submittal. Prepare a new submittal that complies with the Contract Documents. Once the revised submittal is

received it will be reviewed again by the Architect. Once reviewed, the Work may proceed provided it complies with the Contract Documents. Final acceptance will depend on that compliance.

5. Comment Box / Line: This line is for the Architect to take other action as may be appropriate for the actual submittal made. Notations may include a request for additional items or a statement regarding the submittal. This area can also be used in conjunction with other boxes that have been marked.

1.6 SUBMITTAL PROCEDURES - PAPER SUBMITTALS

A. Transmit each submittal in conformance with requirements of this section.

B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphanumeric suffix.

C. Identify Project and Architect's project number, Contractor, Subcontractor or supplier; pertinent Drawing and detail number(s), and specification Section number, as appropriate.

D. Apply Contractor's stamp, signed or initialed certifying that the submittal has been reviewed for compliance with the Contract Documents. Such certification shall confirm that required products have been verified, field dimensions checked, adjacent and related construction coordinated, and all information reviewed for completeness and accuracy. Submittals without the contractor’s stamp and signature will be returned without review. Application of the Contractor’s stamp and signature further constitutes certification that the submittal is complete, coordinated, and in full compliance with the Contract Documents. Submission of incomplete, uncoordinated, or non-conforming submittals is solely the Contractor’s responsibility and shall not constitute a basis for additional time or compensation. Submittals determined to be incomplete or improperly reviewed will be returned without review and shall be resubmitted at no additional cost or time impact to the Owner.

E. Schedule submittals to expedite the Project, and deliver to Architect at 8163 Rochester Avenue, Rancho Cucamonga, CA 91730. Coordinate submission of related items.

F. Make submittals in groups containing associated and related items to make sure that information is available for checking each item when it is received.

G. Submittals for all items requiring color selection must be received before any will be selected.

H. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

I. Make submittals in advance of scheduled dates for installation to allow specified time for review, revisions, and resubmission prior to final review and subsequent placement of orders.

J. 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 proper processing.

K. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

L. Provide space for Contractor and Architect review stamps.

M. Revise and resubmit submittals as required, identify all changes made since previous submittal.

N. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

O. Partial submittals will be considered non responsive and will be returned without review.

P. Submittals not requested will not be recognized or processed. Submittals not requested will be returned without review.

Q. Architect will not review submittals that contain material safety data sheets (MSDS) and will return them for resubmittal.

R. Material safety data sheets (MSDS) will only be reviewed by Architect when submitted to show compliance with LEED certification requirements. Non-LEED submittals that include material safety data sheets will be returned for resubmittal.

S. Substitutions will not be considered when they are indicated or implied on submittals without separate written request as required by provisions of Section 01 25 13 - Product Substitution Procedures.

1.7 SHOP DRAWINGS - PAPER SUBMITTALS

A. Submit six prints of each drawing. Four copies will be retained by Architect.

B. Review comments will be shown on returned print. Contractor will make and distribute copies as required for his purpose.

C. After review, distribute in accordance with article on procedures stated above and provide copies for Record Documents described in Section 01 77 00 - Closeout Procedures.

D. Do not reproduce Contract Documents or copy standard information and submit as shop drawings.

E. Standard information prepared without specific reference to project requirements will not be considered a shop drawing.

F. Do not use or allow others to use shop drawings which have been submitted and have been rejected.

1.8 SUBMITTAL PROCEDURES - ELECTRONIC SUBMITTALS

A. Transmit each electronic submittal in conformance with requirements of this section.

B. Submittals for all items requiring color selections will not be accepted as an electronic submittal.

C. Assemble complete submittal package into a single indexed Portable Document Format (PDF) file. File format licensed by Adobe Systems.

D. Transmit electronic submittals as PDF files via Architect's designated email address.

E. Transmittal form for submittals shall be an electronic form acceptable to the Architect which identifies the Project, the Architect's project number, the Contractor, the Subcontractor or material supplier; pertinent Drawing and detail number(s), and specification Sections, as appropriate.

F. Provide links enabling navigation to each item of submittal package.

G. Name the electronic submittal file with a consistent project identifier composed of the specification section number, followed by the sequential number, submittal description, and numeric file designation in the order of submittal issuance. (e.g., 03 30 00-01-SUB Description_01.pdf).

H. Resubmittals shall include a numeric file designation after initial point number. Any additional resubmittals are to proceed with a sequential number ((e.g., 03 30 00-01-SUB Description_01.1.pdf).

I. Resubmittals shall identify all changes made since previous submittal.

J. Insert Contractor's review stamp to permanently record Contractor's action.

K. Contractor's stamp shall be signed or initialed certifying that review, verification of Products required, field dimensions, adjacent work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

L. Submittals without Contractor's stamp and signature will be returned without review.

M. Provide space for Architect's electronic review stamp.

N. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

O. Make submittals in advance of scheduled dates for installation to allow specified time for review, revisions, and resubmission prior to final review and subsequent placement of orders.

P. 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 proper processing.

Q. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

R. Contractor shall reproduce and distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

S. Partial submittals will be considered non responsive and will be returned without review.

T. Submittals not requested will not be recognized or processed. Submittals not requested will be returned without review.

U. Architect will not review submittals that contain material data safety sheets (MSDS) and will return them for resubmittal.

V. Material safety data sheets (MSDS) will only be reviewed by Architect when submitted to show compliance with LEED certification requirements. Non-LEED submittals that include material safety data sheets will be returned for resubmittal.

W. Substitutions will not be considered when they are indicated or implied on submittals without separate written request as required by provisions of Section 01 25 13 - Product Substitution Procedures.

1.9 SHOP DRAWINGS - ELECTRONIC SUBMITTALS

A. Submit electronic copy of shop drawings in PDF format as specified in this section.

B. Review comments will be indicated on reviewed document.

C. After review, distribute in accordance with article on procedures stated above and provide copies for Record Documents described in Section 01 77 00 - Closeout Procedures.

D. Do not reproduce Contract Documents or copy standard information and submit as shop drawings.

E. Standard information prepared without specific reference to project requirements will not be considered a shop drawing.

F. Do not use or allow others to use shop drawings which have been submitted and have been rejected.

1.10 PRODUCT DATA

A. When specified in individual specification sections, submit copies of data for each product which Contractor requires.

B. Submit six copies of product data made in paper format. Four copies will be retained by Architect.

C. Electronic submittals for product data will comply with Article for electronic submittal procedures stated in this section.

D. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information unique to this Project.

E. Manufacturer's standard product data or catalogs that do not indicate materials or products that are specific to project will be returned without review.

F. After review, distribute in accordance with article on procedures stated above and provide copies for Record Documents described in Section 01 77 00 - Closeout Procedures.

1.11 SAMPLES

A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

B. Include identification on each sample, with full Project information.

C. Submit the number of samples which Contractor requires, plus two which will be retained by Architect.

D. Reviewed samples which may be used in the Work are indicated in individual specification Sections.

E. Submittals for all items requiring color selection must be received before any will be selected.

F. If a variation in color, pattern, texture or other characteristic is inherent within the material or product submitted, sample shall approximate limits of variation.

1.12 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification Sections, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturer's instructions and Contract Documents.

1.13 MANUFACTURER'S CERTIFICATES

A. When specified in individual specification Sections, submit manufacturer's certificate to Architect for review, in quantities specified for Product Data.

B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect.

1.14 DEFERRED APPROVAL REQUIREMENTS

A. 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 authority having jurisdiction. Deferred approval items for this project are the following items:

1. Fire Sprinkler System - Division 21.

2. Fie Alarm System - Section 28 31 00.

3. Underground Fire Line, PIV, and FDC as shown in the civil drawings.

4. Emergency Generator / Docking Station (SCAQMD).

5. Fuel Tank (SCAQMD).

6. Temporary Apparatus Bay

   (a) Contractor to provide required approved anchorage, per manufacturer's recommendation.

7. Temporary Living Quarters (Plans and Calculations).

   (a) The temporary living quarters may be new or used (2005 model year or newer) and must be approved and tagged by the California Department of Housing and Community Development (HCD). Submittals must include HCD-approved plans, along with engineered and professionally stamped foundation and tie-down plans with supporting calculations.

   (b) Contractor to provide required approved anchorage, per manufacturer's recommendation.

   (c) Modular trailer(s) that connect together to provide four (4) bedrooms, two (2) full bathrooms with showers, a full kitchen (sink, refrigerator, electric stove, dishwasher, microwave, etc.), an office, data hub, washer/dryer, water heater(s), HVAC, fire sprinklers, room or small area for weight training, and a living area. Sizes, areas, and amenities shall also conform to those shown in the drawings. The structure shall be equipped with an ADA ramp and a set of stairs, as indicated in the architectural drawings.

   (d) Provide the required septic tank(s) and ensure they are serviced at a minimum of twice per week.

   (e) WillScot (used as basis of design) or equal.

   (f) The Contractor shall establish all utilities including submitting the appropriate applications and paying for all fees required for the Temporary Living Quarters, and also cover the cost of all utility usage for the duration of the project. This includes, but is not limited to, water, electricity, telecommunications, and septic services.

8. Hose Tower (Drawings and Calcs)

B. Deferred approval drawings and specifications become part of the approved documents for the project when they are submitted to and approved by the authority having jurisdiction.

C. Deferred approval items shall be submitted no later than 60 days after Notice to Proceed.

D. Submit prints of each drawing.

E. Submit calculations, product data and test reports.

F. Identify and specify all supports, fasteners, spacing, penetrations, coordination requirements with structural framing and waterproofing assemblies, etc., for each of the deferred approval items, including calculations for each and all fasteners.

G. Submit documents to Architect for review.

H. 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.

I. Architect will forward submittal to project Structural, Mechanical, and Electrical Engineer.

J. Review of project Architect, Structural, Mechanical, and Electrical Engineer is only for conformance with design concept shown on the documents.

K. After review by Architect/Engineer, Architect will forward two copies of submittal to the authority having jurisdiction for approval.

L. Respond to review comments made by the authority having jurisdiction and revise and resubmit submittal for final approval.

M. Architect will forward two copies of final revised submittal to the authority having jurisdiction for approval.

N. The authority having jurisdiction will return one copy of final submittal to the Architect.

O. Architect will forward one copy of evidence of submittal approval by the authority having jurisdiction for final distribution by the Contractor.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

3.1 SUBMITTAL SCHEDULE

END OF SECTION

SECTION 01 42 19

REFERENCE STANDARDS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Definitions.

B. Specification format and content.

C. Industry standards.

D. Codes and standards.

E. Governing regulations/authorities.

1.2 DEFINITIONS

A. General: Basic contract definitions are included in the General Conditions.

B. Regulations: Includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the work.

1.3 SPECIFICATION FORMAT AND CONTENT

A. Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 50-Division Master Format 2018 numbering system.

B. The sections are placed in the Project Manual in numeric sequence; however, this sequence is not complete and the Table of Contents of the specifications must be consulted to determine the total listing of sections.

C. The section title is not intended to limit the meaning or content of the section, nor to be fully descriptive of the requirements specified therein.

D. The organization of the specifications shall not control the division of the work among subcontractors or establish the extent of work to be performed by any trade.

E. Specifications use certain conventions regarding style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are:

1. Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated, shall be interpolated as the sense requires. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable to maintain the context of the Contract Document indicated.

2. Imperative and streamlined language is generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. Subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

3. The words "shall be" are implied wherever a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

A. Except where Contract Documents include more stringent requirements, applicable construction industry standards shall apply as if bound into the Contract Documents to the extent referenced. Such standards are made part of Contract Documents by reference.

B. Conform to reference standard by date of issue current on date for receiving bids except when a specific date is indicated.

C. Where compliance with 2 or more standards is specified and where standards may establish different or conflicting requirements for quantities or quality levels, the more stringent, higher quality and greater quantity of work shall apply.

D. The quantity or quality level shown or specified shall be the minimum provided or performed. Indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements.

E. Each entity engaged in construction of the work is required to be familiar with industry standards applicable to its construction activity.

F. Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed to perform a required activity, Contractor shall obtain copies directly from publication source.

G. Trade associations names and titles of general standards are frequently abbreviated. Where such abbreviations are used in the Specifications or other Contract Documents, they shall mean the recognized trade association, standards-generating organization, authority having jurisdiction, or other entity applicable to the content of the text provision. Refer to the "Encyclopedia of Associations", published by Gale Research Co., available in most libraries.

H. Refer to individual specification sections and related drawings for names and abbreviations of trade associations and standards applicable to specific portions of the work. In particular, refer to Division 23 for names and abbreviations applicable to mechanical work, and refer to Division 26 for names and abbreviations applicable to electrical work.

I. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.5 CODES AND STANDARDS

A. Latest edition of pertaining ordinances, laws, rules, codes, regulations, standards, and others of public agencies having jurisdiction of the work are intended wherever reference is made in either the singular or plural to Code or Building Code except as otherwise specified, including but not limited to latest edition of those in the following listing.

1.	2022 California Building Standards Administrative Code (CBSAC), California Code of Regulations (CCR), Title 24, Part 1	
2.	2022 California Building Code (CBC) California Code of Regulations (CCR) Title 24, Part 2	(2021 International Building Code (IBC) with California amendments)
3.	2022 California Electrical Code (CEC) California Code of Regulations (CCR) Title 24, Part 3	(2020 National Electric Code (NEC) with California amendments)
4.	2022 California Mechanical Code (CMC) California Code of Regulations (CCR) Title 24, Part 4	(2021 Uniform Mechanical Code (UMC) with California amendments)
5.	2022 California Plumbing Code (CPC) California Code of Regulations (CCR) Title 24, Part 5	(2021 Uniform Plumbing Code (UPC) with California amendments)
6.	2022 California Energy Code, California Code of Regulations (CCR) Title 24, Part 6	

7. 2022 California Fire Code (CFC) California Code of Regulations (CCR) Title 24, Part 9 (2021 International Fire Code (IFC) with California Amendments)

8. 1990 State Fire Marshal Regulations California Code of Regulations (CCR) Title 19 (As amended to date)

9. 2022 California Green Building Standards Code (CALGreen) California Code of Regulations (CCR) Title 24, Part 11.

10. 2022 State Referenced Standards Code (CRSC) California Code of Regulations (CCR) Title 24, Part 12

11. California Elevator Safety Code, California Code of Regulations (CCR) Title 8. (As amended to date)

12. 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design. (ADAS)

1.6 GOVERNING REGULATIONS/AUTHORITIES

A. Authorities having jurisdiction have been contacted where necessary to obtain information for preparation of Contract Documents. Contact authorities having jurisdiction directly for information having a bearing on the work.

B. Comply with all federal, state and local laws, ordinances, rules and regulations indicated and which bear on the conduct of the work.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 43 00

QUALITY ASSURANCE

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interpretation of requirements.

B. Quality assurance and control of installation.

C. Tolerances.

D. Field samples.

E. Mock-up.

F. Manufacturers' field services and reports.

1.2 INTERPRETATION OF REQUIREMENTS

A. 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.

B. The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation shall comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits.

C. Where codes or specified standards indicate higher standards, more stringent tolerances or more precise workmanship than levels shown or specified, comply with most stringent requirements.

D. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

1.3 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. 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.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. 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. Resolve conflicts before installation as coordination failures do not justify extra compensation or time.

E. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

F. Comply fully with manufacturers' instructions, including each step in sequence.

G. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

H. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.4 TOLERANCES

A. Monitor tolerance control of installed products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturer's tolerances. Should manufacturer's tolerance conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.5 FIELD SAMPLES

A. Install field samples at the site as required by individual specifications sections for review.

B. Acceptable samples represent a quality level for the Work.

C. Where field sample is specified in individual sections to be removed, clear area after field sample has been reviewed by Architect.

1.6 MOCK-UP

A. Mock-up will be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items, with specified attachment and anchorage devices, flashings, seals and finishes.

C. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

D. Where mock-up is specified in individual Sections to be removed, clear area after mock-up has been reviewed by Architect.

1.7 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment and other field services as applicable, and to initiate instructions when necessary.

B. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

C. Submit report in duplicate within 15 days of observation to Architect for review.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

3.1 GENERAL INSTALLATION

A. Comply with requirements specified in Section 01 73 00.

3.2 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.3 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

SECTION 01 45 29

TESTING LABORATORY SERVICES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Selection and payment.

B. Contractor submittals.

C. Laboratory responsibilities.

D. Laboratory reports.

E. Limits on testing laboratory authority.

F. Contractor responsibilities.

G. Schedule of inspections and tests.

H. Test and inspection form.

1.2 REFERENCES

A. ASTM C140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.

B. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

C. ASTM E329 - Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

D. CBC - California Building Code, Title 24, Part 2 of the California Code of Regulations (CCR).

1.3 SELECTION AND PAYMENT

A. Owner will employ and pay for services of an independent testing laboratory to perform specified inspection and testing as specified by Owner's testing laboratory.

B. Owner will pay cost of testing and inspection except the following for which the Contractor shall reimburse the Owner through deductive change order:

1. Any retesting and sampling required due to failure of original test.

2. Any testing and inspection required to be performed that requires testing laboratory or agency to perform services outside the state of California.

3. Concrete design mix.

4. Additional testing expenses caused by failure of the Contractor to adhere to construction schedule or caused by failure of the Contractor to give proper advanced notice or caused by Contractor delay.

C. Contractor shall employ and pay for services required to perform specified inspection and testing specified as Contractor responsibility.

D. Employment of testing laboratory shall in no way relieve Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.4 QUALITY ASSURANCE

A. Comply with requirements of ASTM E329 and ASTM D3740.

B. Laboratory Staff: Maintain a full time registered engineer on staff to review services.

C. Testing Equipment: Capable of performing tests required calibrated at reasonable intervals with devices acceptable to the National Bureau of Standards.

D. All testing agency management, laboratory, and field supervisory personnel shall have at least five years experience in the inspection and testing of work and materials of construction.

1.5 OWNER'S TESTING LABORATORY RESPONSIBILITIES

A. Test samples of mixes submitted by Inspector.

B. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.

C. Perform specified inspection, sampling, and testing of products in accordance with specified standards.

D. Ascertain compliance of materials and mixes with requirements of Contract Documents.

E. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.

F. Perform additional inspections and tests required by Architect.

G. Attend preconstruction conferences and progress meetings when requested by Architect.

1.6 LABORATORY REPORTS

A. After each inspection and test, promptly submit within no more than 14 days of the date of the inspection or test one copy of laboratory report to Architect, Engineer, Owner and 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 to the Architect, Engineer, Owner's and the Contractor.

B. Include:

1. Date issued.

2. Project title and number.

3. Name of inspector.

4. Date and time of sampling or inspection.

5. Identification of product and Specifications section.

6. Location in the Project.

7. Type of inspection or test.

8. Date of test.

9. Ambient conditions at time of test or sample-taking.

10. Results of tests and interpretation of test results.

11. Professional opinion as to whether tested work is in conformance with Contract Documents.

12. Recommendations on retesting.

C. Verification of Test Reports: Each testing agency shall submit to the Architect a verified report in duplicate 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 on the project is suspended, covering the tests up to that time and at the completion of the project, covering all tests.

1.7 LIMITS ON TESTING LABORATORY AUTHORITY

A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. Laboratory may not approve or accept any portion of the Work.

C. Laboratory may not assume any duties of Contractor.

D. Laboratory has no authority to stop the Work.

1.8 CONTRACTOR RESPONSIBILITIES

A. Submit proposed mix designs to Architect for review in accordance with Section 03 30 00.

B. Cooperate with laboratory personnel, and provide access to the Work and to manufacturer's facilities.

C. Notify Architect, Owner's and testing laboratory 48 hours prior to expected time for operations requiring inspection and testing services.

1. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to the Contractor's negligence.

2. The Contractor shall notify the Owner's representative a sufficient time in advance of the manufacture of material to be supplied by him under the Contract Documents, which must by terms of the Contract be tested, in order that the Owner may arrange for the testing of same at the source of supply.

3. 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 from said representative that such testing and inspection will not be required shall not be incorporated in the job.

D. Employ and pay for services of Owner's testing laboratory to perform additional inspections, sampling and testing required when initial tests indicate work does not comply with contract documents.

1.9 SCHEDULE OF INSPECTIONS AND TESTS BY OWNER'S TESTING LABORATORY

A. Perform tests and inspections for the following in conformance with the (CBC) California Building Code (International Building Code with State of California Amendments), Title 24, Part 2, of the California Code of Regulations (CCR).

1. Structural Tests and Special Inspections

(a) General - 1701A

(b) Approvals - 1703A

(c) Special Inspections - 1704A

(1) Structural Steel - 1705A.2 and Table 1705A.2.1

(2) Welding - 1705A.2.5 and Table 1705A.2.1.

(3) High Strength Fasteners - 1705A.2.6 and Table 1705A.2.1

(4) Concrete - 1705A.3 Table 1705A.3 and 1910A

(5) Precast Concrete - 1705A.3 and Table 1705A.3

(6) Post Installed Anchors In Concrete - Table 1705A.3, 1910A.5 and 1909.2.7

(7) Masonry - 1705A.4, TMS 402 and TMS 602 Table 3 and 4

(8) Post Installed Anchors in Masonry - Table 1705A.3, 1910A.5 and 1909.2.7

(9) Masonry Veneer - 1705A.4.1

(10) Structural Glued-Laminated Timber - 1705A.5.4

(11) Wood - 1705A.5

(12) Soils - 1705A.6 and Table 1705A.6

(d) Special Inspections for Seismic Resistance - Section 1705A.12

(1) Structural Steel - Continuous Inspection, Welding - 1705A.12.1, 1705A.2.1, 1705.A.2.5

(2) Structural Wood - Continuous and Periodic Inspection - 1705A.11.1 and 1705A.12.2

2. Foundations (Chapter 18A)

(a) Earth fill compaction - 1803A.5.8

3. Concrete (Chapter 19A)

(a) Concrete Inspection

(1) Portland Cement Tests - 1910A.1

(2) Reinforcing Bars Table - 1705A.2.1, 1910A.2

(3) Waiver of Reinforcing Bar Tests - 1910A.2

(4) Prestressing Steel & Anchorage - 1910A.3

(5) Batch Plant Inspection - 1705A.3.3

(6) Waiver of Batch Plant Inspection - 1705A.3.3.1, 1705A3.3.2

(7) Frequency of Tests for Concrete - 1905A.1.15

(b) Concrete Quality

(1) Proportions of Concrete - 1903A, 1904A, 1905A

(c) Job Site Inspection

(1) Site Placement Inspection - 1705A.3.5

(d) Anchors in Concrete

(1) Drilled-In-Expansion Bolts or Epoxy-Type Anchors in Concrete - 1910A.5

4. Masonry (Chapter 21A)

(a) Materials

(1) Masonry Units - 2103A.1

(2) Mortar - 2103A.2

(3) Grout - 2103A.3

(4) Grout Aggregates - 2103A.3.1

(5) Reinforcing Bars - 2103A.4

(b) Masonry Tests

(1) General - 2105A.1, 1705A.4, TMS 402 and TMS 602, Table 3 and 4

(2) Masonry Tests - 2105A.2

(3) Mortar and Grout - 2105A.3

(4) Masonry Core Tests -2105A.4

(5) Mason Prism Test - 2105A.5

(6) Unit Strength Test - 2105A.6

5. Structural Steel (Chapter 22A)

(a) Materials

(1) Material Identification - 2202A

a) Anchor Bolt - DSA IR 17-11

(2) Inspection and Tests of Structural Steel 1705A.2

(3) Tests of H.S. Bolts, Nuts, Washers - 2213A.1

(4) Tests of End Welded Studs - 2213A.2

(5) Steel Joist Tests - 1705A.2.3 and Table 1705A.2.3

(6) Shop Fabrication Inspection - 1704A.2.5

(7) High Strength Bolt Inspection - 1705A.2.6 - Table 1705A2.1, 2213A.1

(8) Welding Inspection - 1705A.2.5 and Table 1705A.2.1

(9) Nelson Stud Welding - 2213A.2

(10) Non-Destructive Weld Testing - DSA IR 17-2

6. Wood (Chapter 23)

(a) Materials

(1) Lumber and Plywood Grading - 2303

(2) Pre-Fabricated Wood I-Joists - 2303.1.2

(3) Glued-Laminated Members - 2303.1.3

(4) Wood Structural Panels - 2303.1.5

(5) Fiberboard - 2303.1.6

(6) Hardboard - 2303.1.7

(7) Particleboard - 2303.1.8

(8) Floor Underlayment - 2303.1.8.1

(9) Preservative Treatment - 2303.1.9

(10) Structural Composite Lumber - 2303.1.10

(11) Fire-Retardant Treated Wood - 2303.2

(b) Wood Inspection

(1) Timber Connectors - 1705A.5.6

(2) Plate Connected Wood Trusses - 1705A.5.2

(3) Glu-Laminated Fabrication - 1705A.5.4

7. Veneer (Chapter 14)

(a) Materials

(1) Masonry Units - 1403.4, 2103A

(2) Precast Concrete Units - 1403.6

(3) Mortar and Grout 2103A.2, 2103A.3

(4) Bond and Shear Tests - 1410.2.1

(b) Inspection of Veneer

(1) Veneer Inspection - 1705A.4.1

8. Roof Covering (Chapter 15)

(a) Installation

(1) Roof Tile - 1507.3.10, 1513

B. Special Inspection - 1704 - As indicated on the drawings.

C. Perform additional test required by individual Specification Sections.

1.10 SCHEDULE OF INSPECTIONS AND TESTS BY CONTRACTOR

A. Contractor Responsibility:

1. Statement of Responsibility - 1704A.4 Refer to listed special inspections under Article 1.9.

B. Planting and Irrigation:

1. Testing as specified in Division 32 including, but not limited to; soils analysis and irrigation pressure testing.

C. Plumbing:

1. Testing as specified in Division 22 including, but not limited to: Sterilization, soil waste and vent, water piping, source of water, gas piping, downspouts and storm drains.

D. Automatic Fire Sprinklers:

1. Testing as specified in Division 21 shall include, but not be limited to: hydrostatic pressure.

E. Heating, Ventilating and Air Conditioning:

1. Testing as specified in Division 21 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.

F. Electrical

1. Testing as specified in Division 26 including, but not limited to: Equipment testing, all electrical system operations, grounding system and checking insulation after cable is pulled.

1.11 INSPECTION BY THE OWNER

A. An Inspector employed by the Owner in accordance with the requirements of the California Code of Regulations Title 24, Part 1 will be assigned to the work. His duties are specifically defined in Section 4-342 of Title 24, Part 1.

B. The Owner and his representatives 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 the Contractor shall at all times maintain proper facilities and provide safe access for such inspection.

C. The work of construction in all stages of progress shall be subject to the personal continuous observation of the Inspector. He shall have free access to any or all parts of the work at any time. The Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep him 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 to fulfill this Contract. The presence of an Inspector shall in no way change, mitigate or alleviate the responsibility of the Contractor.

D. 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.

E. Whenever there is insufficient evidence of compliance with any of the provisions of Title 24, Part 2 of the California Code of Regulations or evidence that any material or construction does not conform to the requirements of Title 24, Part 2 of the California Code of Regulations, the Owner 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 Owner. All tests shall be performed by a testing laboratory accepted by Owner.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone service, communication service, water, and sanitary facilities.

B. Temporary Controls: Barriers, enclosures and fencing. Water, erosion, pollution, noise and fire protection control.

C. Construction Facilities: Access roads, parking, progress cleaning, project signage, and temporary buildings.

1.2 SUBMITTALS

A. Moisture-Protection Plan:

1. Submit Moisture - Protection Plan under provisions of Section 01 33 00.

2. Describe procedures and controls for protecting materials and construction from moisture absorption and damage, including delivery, handling, and storage provisions for materials subject to moisture absorption or moisture damage, discarding moisture-damaged materials, protocols for mitigating moisture intrusion into completed Work, and replacing moisture damaged Work.

3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, sawing and grinding, and describe plans for dealing with water and moisture from there operations.

4. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

1.3 TEMPORARY ELECTRICITY

A. Provide and pay for power service required from Utility source.

B. Provide power outlets for construction operations, with branch wiring and distribution boxes. Provide flexible power cords as required.

C. Provide main service disconnect and over current protection at convenient location.

D. Comply with NECA, NEMA, and UL standards and regulations for temporary electric service.

E. Permanent convenience receptacles may be utilized during construction.

1.4 TEMPORARY LIGHTING

A. Provide and maintain lighting for construction operations, observations, inspections, and traffic conditions.

B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

C. Maintain lighting and provide routine repairs.

D. Permanent building lighting may be utilized during construction.

1.5 TEMPORARY HEATING/COOLING

A. Provide and pay for devices as required to maintain specified thermal conditions for construction operations.

B. Only electric or indirect fired combustion heaters shall be used. No direct fired space heaters will be allowed.

C. Heaters will be equipped with controls to automatically turn off heater if airflow is interrupted or internal temperature exceeds design temperature.

D. Do not use permanent equipment for temporary purposes.

E. Maintain minimum ambient temperature of 50 degrees F and maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

F. Maintain temperature above dew point of enclosed space based upon relative humidity of enclosed area.

G. Continuously monitor temperature of enclosed space(s) using an electronic monitoring device (s). Place devices in locations that will record average temperature of building(s). Provide print out to Architect upon request.

1.6 TEMPORARY VENTILATION

A. Ventilate enclosed areas to assist cure of materials and to prevent accumulation of dust, fumes, vapors, or gases.

B. Do not use permanent equipment for temporary ventilation purposes.

C. Ventilate enclosed spaces to dissipate humidity. Maintain a maximum relative humidity level of less than 60 percent. Avoid pockets of high humidity.

D. Continuously monitor humidity of enclosed space(s) using an electronic monitoring device(s). Place devices in locations that will record average humidity of building(s). Provide print out to Architect upon request.

1.7 TEMPORARY HUMIDITY CONTROL

A. Provide temporary ventilation during construction activities to protect installed construction from adverse effects of high humidity and moisture.

B. Select equipment that will not have a harmful effect on completed installations or elements being installed.

C. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

D. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

E. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record daily readings over a forty-eight hour period. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.

1.8 TELEPHONE SERVICE

A. Provide, maintain and pay for telephone service to field office and Owner's/Inspector's field office at time of project mobilization. Inspector's office to have separate telephone line.

B. Provide mobile telephone service for project superintendent for use when away from field office.

1.9 ELECTRONIC COMMUNICATION SERVICE

A. Provide minimum DSL electronic communication service, including electronic mail, in primary field office.

1.10 TEMPORARY WATER SERVICE

A. Provide, maintain and pay for suitable quality water service required for construction operations. Contractor may obtain water from existing fire hydrant if appropriate clearances are acquired and fees paid.

B. Extend branch piping with outlets located so water is available by hoses with threaded connections.

1.11 TEMPORARY SANITARY FACILITIES

A. Provide temporary chemical type toilet facilities and enclosures.

B. Maintain temporary toilet facilities in a sanitary manner.

C. Existing facilities shall not be used.

D. Facilities shall comply with the accessibility requirements of the CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Section 11B-201.4.

1.12 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way.

C. Provide protection for plant life and trees designated to remain and for soft and hardscape areas adjacent to work, replace damaged materials in kind.

D. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

1.13 FENCING

A. Construction: Commercial grade chain link fence with fabric.

B. Provide 8 foot high fence around construction site; equip with vehicular and pedestrian gates with locks. Post fences and gates with no trespassing signs.

1.14 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Provide water barriers as required to protect site from running water.

1.15 EROSION AND SEDIMENT CONTROL

A. Conform to Best Management Practices for erosion and sediment control and non-storm water management as defined in Sections 3 and 4 of the Construction Activity Handbook published by the Storm Water Quality Association.

B. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

C. Minimize amount of bare soil exposed at one time.

D. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.

E. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

F. Coordinate construction activities with control procedures established in the Storm Water Pollution Prevention Plan (SWPPP).

1.16 TEMPORARY FIRE PROTECTION

A. Maintain temporary fire protection facilities of the types needed until permanent facilities are installed.

B. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations".

C. Fire safety during construction shall comply with CFC - California Fire Code (CCR) California Code of Regulations, Title 24, Part 9, Chapter 33.

D. Store combustible materials in containers in fire-safe locations.

E. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes.

F. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

1.17 NOISE CONTROL

A. Provide methods, means, and facilities to minimize noise produced by construction operations.

1.18 POLLUTION CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

B. Conform to Best Management Practices for waste management and material controls as defined in Section 4 of the Construction Activity Handbook published by the Storm Water Quality Association.

C. Coordinate construction activities with control procedures established in the Storm Water Pollution Prevention Plan (SWPPP).

1.19 EXTERIOR ENCLOSURES

A. Provide temporary weather-tight closure of exterior openings to accommodate acceptable working conditions and protection for materials, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification Sections, and to prevent entry of unauthorized persons.

B. Provide access doors with self-closing hardware and locks.

1.20 SECURITY

A. Provide security and facilities to protect Work from unauthorized entry, vandalism, or theft.

1.21 ACCESS ROADS

A. Construct and maintain temporary roads accessing public thoroughfares to serve construction area. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow.

B. Stabilize temporary vehicle transportation routes and construction entrances to prevent erosion and control dust immediately after grading in accordance with best management practice techniques defined in Section 3 of the Construction Activity Handbook published by the Storm Water Quality Association.

C. Maintain stabilization techniques as work progresses.

D. Provide and maintain access to fire hydrants, free of obstructions.

E. Existing on-site roads may be used for construction traffic.

1.22 PARKING

A. The Contractor's project-related traffic at the site or in the public right of way shall be coordinated with City. If necessary, within 10 calendar days after the Notice to Proceed is issued, Contractor shall submit a Traffic Control Plan for review and acceptance by City. The traffic control should follow the latest edition of the California MUTCD. The Traffic Control Plan shall address, at a minimum, the following:

1. Protection of existing improvements.

2. Maintaining access by City of Costa Mesa representatives.

3. Proposed haul routes for delivery of materials.

4. Access to work areas.

5. Contractors staging and material storage areas, including fuel storage procedures.

B. Arrange for temporary surface parking areas to accommodate construction personnel.

C. Stabilize temporary surface parking areas immediately after grading to prevent erosion and control dust in accordance with Best Management practice techniques defined in Section 3 of the Construction Activity Handbook published by the storm Water Quality Association.

D. Maintain stabilization techniques as work progresses.

1.23 TRAFFIC CONTROL

A. The Contractor's project-related traffic at the site or in the public right of way shall be coordinated with City. If necessary, within 10 calendar days after the Notice to Proceed is issued, Contractor shall submit a Traffic Control Plan for review and acceptance by City. The traffic control should follow the latest edition of the California MUTCD. The Traffic Control Plan shall address, at a minimum, the following:

1. Protection of existing improvements.

2. Maintaining access by City of Costa Mesa representatives.

3. Proposed haul routes for delivery of materials.

4. Access to work areas.

5. Contractors staging and material storage areas, including fuel storage procedures.

B. Comply with requirements of authorities having jurisdiction.

C. Obtain all permits, provide all materials and maintain controls as required of authorities having jurisdiction.

D. Maintain access for fire-fighting equipment and access to hydrants.

1.24 PROGRESS CLEANING

A. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

B. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

C. Provide walk-off mats at each building entry.

1.25 WASTE DISPOSAL

A. Waste Management: In compliance with Section 01 74 19 - Construction Waste Management and Disposal.

B. Maintain building areas free of waste materials, debris, and rubbish.

C. Remove waste materials, debris, and rubbish from site periodically and legally dispose of off site.

D. Maintain site area in a clean and orderly condition.

1.26 PROJECT IDENTIFICATION

A. Provide two (2) required project vinyl signs, including dimensions, locations, and content, as directed by the Owner.

B. List title of Project, names of Owner, Architect and Contractor.

C. Erect on site at location established by Architect.

D. Sign to remain in place through construction period and shall be removed only after dedication of the project.

E. Provide temporary directional signs for construction personnel and visitors.

F. No other signs are allowed except those required by law.

1.27 FIELD OFFICES

A. Office: Weather-tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture drawing rack and drawing display table.

B. Maintain daily janitorial service for offices. Maintain approach to office free of mud and water.

C. Provide separate private office, large enough and similarly equipped and furnished, for use by the Owner, Construction Manager, and Project Meetings. The contractor shall provide and pay for all power, water, telephone and high speed internet service and sanitary services. Provide space for Project meetings, with table and chairs to accommodate 12 persons. See Facilities for Agency Personnel for further requirements.

D. When permanent facilities are enclosed with operable utilities, relocate offices into building, with written agreement of Owner, and remove temporary buildings.

E. Facilities shall comply with the accessibility requirements of the CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Section 11B-201.4.

1.28 FACILITIES FOR AGENCY PERSONNEL

A. Contractor to provide a private office for the CM personnel to accommodate the needs of the Owner, Architect, Construction Manager, and to accommodate project meetings specified in other Sections. Keep office clean and orderly. The trailer(s) shall be located as shown in the Drawings or as directed by the City of Costa Mesa. Furnish and equip offices for the Construction Manager personnel as follows:

1. Provide a restroom containing a water closet and lavatory within the confines of the facility.

2. Furniture required for project-site documents including chair, desk, file cabinet, plan table, plan rack, and bookcase.

3. Conference room of sufficient size to accommodate meetings of 12 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no less than one receptacle on each wall. Furnish conference room with conference table, chairs, 4-foot square tack and marker boards.

4. Provide hot and cold drinking water two (2); five-gallon jugs and one (1) case of bottled water, kitchenette, coffee machine, supplies, refrigerator, microwave oven, and receptacles for kitchen.

5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg. F.

6. Lighting fixtures capable of maintaining average illumination of 100 fc (1000 lux) at desk height.

7. Printer: “All-in-one” high speed unit equipped with printer server, combining color printing, photocopying, faxing and scanning to email capabilities, or separate units for each of these three functions.

8. High Speed Internet Service: Hardline networked broadband modem, router and ISP, equipped with hardware firewall, providing minimum 15 Mbps upload and 15 Mbps download speeds at each computer.

9. Boot cleaning device and doormats at each exterior door.

10. Hard hat and coat racks located near each exterior door.

11. Provide field offices with siding type windows, 4 feet by 4 feet, with aluminum frame and insect screens. Windows shall have mini blinds.

1.29 STORAGE AREAS AND SHEDS

A. Size to storage requirements for products of individual Sections. Allow for access and orderly provision for maintenance and for inspection of products.

1.30 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Maintain temporary equipment, facilities and controls until Substantial Completion or when use is no longer required.

B. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to Substantial Completion review.

C. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

D. Clean and repair damage caused by installation or use of temporary work.

E. Materials and facilities that constitute temporary facilities are property of the Contractor.

F. Restore existing facilities used during construction to original condition.

G. Restore permanent facilities used during construction to specified condition.

H. Replace construction that cannot be satisfactorily restored.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 57 31

CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT

1. PART 1 GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. LEED EQp, Environmental Tobacco Smoke Control: Prevent exposure of building systems to environmental tobacco smoke during construction.

2. LEED EQc, Construction Indoor Air Quality Management Plan: Requirements for minimum indoor air quality (IAQ) performance standards during the construction period.

B. Sustainable Design Intent: Comply with project requirements intended to achieve certification, measured and documented according to the LEED Green Building Rating System, of the US Green Building Council. Refer to Section 01 81 13 – “Sustainable Design Requirements,” for certification level and certification requirements.

C. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 01 74 19 – “Construction Waste Management” for demolition and construction waste management.

2. Division 23 – “HVAC” for coordination with HVAC requirements.

3. Divisions 02 through 49 Specification Sections for specific requirements relating to indoor air quality.

1.3 PERFORMANCE REQUIREMENTS

A. LEED EQp, Environmental Tobacco Smoke Control: At a minimum, take the following measures:

1. Comply with Owner’s Non-Smoking Campus Policy.

2. Do not allow smoking in enclosed portions of the project site, on the rooftop, or in construction trailers.

a. This prohibition includes electronic cigarettes.

3. Locate exterior designated smoking areas at least 25 feet away from entries, outdoor air intakes, and operable windows. Provide signage for designated smoking areas, located within 10 feet of each entry. Provide ash receptacles and clean areas daily.

B. LEED EQc, Construction Indoor Air Quality Management Plan: During construction, comply with the following requirements:

1. Coordinate with Owner’s current IAQ management plans and procedures.

2. Meet or exceed the minimum requirements of the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, Second Edition, November 2007, Chapter 3.

3. If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used at each return air grille, as determined by ASHRAE 52.2-2017. Replace filtration media immediately prior to occupancy, according to Division 23 - HVAC.

1.4 SUBMITTALS

A. LEED EQc, Construction Indoor Air Quality Management Plan: Within 21 calendar days after receipt of Notice to Proceed, the Contractor shall submit Construction IAQ Management Plan.

1. Construction IAQ Management Plan: Include, but do not limit to, the following:

a. HVAC Protection.

b. Source Control.

c. Pathway Interruption.

d. Housekeeping.

e. Scheduling.

2. Product Data: Submit for each type of filtration media used during construction and installed immediately prior to occupancy, with MERV values clearly identified.

2. PART 2 PRODUCTS

1.5 FILTRATION MEDIA

A. Filtration Media: Comply with ASHRAE 52.2-2017 and provide MERV as required.

3. PART 3 EXECUTION

1.6 CONSTRUCTION IAQ MANAGEMENT PLAN IMPLEMENTATION

A. IAQ Manager: The Contractor shall designate an on-site person responsible for instructing workers and overseeing and documenting results of the Construction IAQ Management Plan for the Project.

1. Distribution: The Contractor shall distribute copies of the Construction IAQ Management Plan to the Job Site Foreman, each subcontractor, the Owner, and the Architect.

2. Instruction: The Contractor shall provide on-site instruction of appropriate procedures and methods to be used by all parties at the appropriate stages of the Project.

B. Preconditioning: Allow products, which have odors and significant VOC emissions, to off-gas in a dry, well-ventilated space for sufficient period to dissipate odors and emissions prior to delivery to Project.

1. Remove containers and packaging from materials prior to conditioning to maximize off-gassing of VOCs.

2. Condition products in ventilated warehouse or other building.

C. Ventilation: Ventilate interior spaces directly to the exterior to minimize accumulation of odors and VOC emissions during construction.

END OF SECTION

SECTION 01 61 00

PRODUCT REQUIREMENTS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products.

B. Transportation and handling.

C. Storage and protection.

D. Damage and restoration.

1.2 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work.

B. Products specified or recycled from other projects are not considered new products.

C. Provide interchangeable components of the same manufacturer, for similar components.

D. Provide products that comply with the Contract Documents, that are undamaged and are unused at the time of installation.

E. Provide products complete with all accessories, trim, finish, safety guards and other devices and detail needed for a complete installation and for the intended use and effect.

F. Where a specific manufacturer's product is specified as the basis of design, the designation shall establish the qualities relating to type, function, dimension, in-service performance, physical properties, appearance and other characteristics for comparable products of other named manufacturers.

G. Where products are specified by name or by manufacturer provide the product or manufacturer specified. No substitutions will be permitted unless made under the provisions of Section 01 25 13.

H. Where specifications only describe a product or assembly by listing exact characteristics required, provide a product or assembly that provides the characteristics.

I. Where specifications only require compliance with performance requirements, provide products that comply with those requirements.

J. Where the specifications only require compliance with an imposed code, standard or regulation, provide a product that complies with the standards, codes or regulations specified.

K. Where specifications require review and acceptance of a sample, the Architect's decision will be final on whether a proposed product sample is acceptable or not.

L. Provide materials and products specified in the full range of color, texture and pattern for selection by Architect. 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, Architect may select from any color range at no additional cost to Owner.

1.3 TRANSPORTATION AND HANDLING

A. Transport and handle products in accordance with manufacturer's instructions.

B. Schedule delivery to minimize long-term storage at site to prevent overcrowding of construction spaces.

C. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.

D. Deliver products in manufacturer’s original sealed container or packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

E. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

F. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.4 STORAGE

A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.

B. Store sensitive products in weather-tight, climate controlled enclosures.

C. Store products in a manner that will not damage or overload project structure.

D. For exterior storage of fabricated products, place on sloped supports, above ground.

E. Provide off-site storage when site does not permit on-site storage .

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

G. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

J. Prevent the discharge of pollutants to storm water from storage of materials on-site using best management practice techniques defined in Chapter 4 of the Construction Activity Handbook published by the Storm Water Quality Task Force.

1.5 PROTECTION

A. Protect installed Work and provide special protection where specified in individual specification Sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Provide humidity and temperature control for installed products as recommended by materials manufacturer.

G. Prohibit traffic from landscaped areas.

1.6 DAMAGE AND RESTORATIONS

A. Damage to existing or new work whether accidental or not shall be restored or replaced as specified or directed by Architect.

B. Restoration shall be equal to structural performance of original work.

C. Finish shall match appearance of existing adjacent work.

D. Work not properly restored or where not capable of being restored shall be removed and replaced.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 73 00

EXECUTION REQUIREMENTS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. General procedural requirements governing execution of the Work.

1. Construction layout.

2. Field engineering and surveying.

3. General installation of products.

1.2 SUBMITTALS

A. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

B. Certified Surveys: Submit two copies signed by land surveyor.

C. Final Property Survey: Submit 2 copies showing the Work performed and record survey data.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Existing Conditions: Existence and location of site improvements and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify existence and location of construction affecting the Work.

B. Existing Utilities: Existence and location of underground and other utilities indicated as existing are not guaranteed. Before beginning work, investigate and verify existence and location of underground utilities affecting the Work.

1. Before construction, verify location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and electrical services.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where conditions detrimental to performance of the Work are encountered, provide a written report listing the following:

(a) Description of the Work.

(b) List of detrimental conditions, including substrates.

(c) List of unacceptable installation tolerances.

(d) Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers.

3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

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

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of need for clarification of Contract Documents, submit a Request For Information (RFI) to Architect. Include a detailed description of problem encountered, together with recommendations for resolution of the item discovered.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor, registered in the state of California to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.

2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.

4. Check the location, level and plumb, of every major element as the Work progresses.

5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.

6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Control datum for survey is that established by Owner provided survey.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. 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.

E. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

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.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

4. Maintain maximum headroom clearance in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. 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.

G. 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.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

2. Allow for building movement, including thermal expansion and contraction.

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

H. 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.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements and limitations for cutting and patching of Work.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore surfaces to original or specified conditions after installation of other work.

1.3 REGULATORY REQUIREMENTS

A. Unless specifically shown on the drawings, no structural member shall be cut, drilled, or notched without prior written authorization from the Architect.

1.4 SUBMITTALS

A. Submit written request in advance of cutting or patching which affects:

1. Structural integrity of any element of Project.

2. Integrity of weather-exposed or moisture-resistant element.

3. Efficiency, maintenance, or safety of any operational element.

4. Visual qualities of sight exposed elements.

5. Work of Owner or separate contractor.

B. Include in request:

1. Identification of Project.

2. Location and description of affected work.

3. Necessity for cutting or patching.

4. Description of proposed work, and Products to be used.

5. Alternatives to cutting and patching.

6. Effect on work of Owner or separate contractor.

7. Written permission of affected separate contractor.

8. Date and time work will be executed.

1.5 QUALITY ASSURANCE

A. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Do not cut or patch operating elements that would reduce their capacity to perform or that would result in increased maintenance or decreased operational life or safety.

C. Do not cut or patch construction that would result in visual evidence of cutting or patching.

D. Remove and replace construction that has been cut or patched in a visually unsatisfactory manner.

2. PART 2 PRODUCTS

2.1 MATERIALS

A. Primary Products: Those required for original installation.

B. Substitutions: Under provisions of Section 01 25 13.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Inspect existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.

B. After uncovering existing Work, inspect conditions affecting performance of work.

C. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.

B. Provide protection from elements for areas which may be exposed by uncovering work.

3.3 CUTTING AND PATCHING

A. Execute cutting, fitting, and patching to complete Work.

B. Fit Products together, to integrate with other work.

C. Uncover work to install ill timed work.

D. Remove and replace defective or non-conforming work.

E. Remove samples of installed work for testing when requested.

F. Provide openings in the Work for penetration of mechanical and electrical work.

G. Cut rigid materials using saw or drill. Pneumatic tools not allowed without prior approval.

3.4 PERFORMANCE

A. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.

B. Employ skilled and experienced installer to perform cutting and patching.

C. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

D. Restore work with new Products in accordance with requirements of Contract Documents.

E. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

F. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material, to full thickness of the penetrated element.

G. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

3.5 CLEANING

A. Clean areas and spaces where cutting and patching was performed.

B. Completely remove paint, mortar, oils, sealant, and similar materials.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

1. 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 administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

B. Related Sections include the following:

1. Division 01 Section "Multiple Contract Summary" for coordination of responsibilities for waste management.
2. Division 01 Section "Temporary Facilities and Controls" for environmental-protection measures during construction, and location of waste containers at the Project Site.
3. Division 02 Section "Structure Demolition" for disposition of waste resulting from demolition of buildings, structures, and site improvements, and for disposition of hazardous waste.
4. Division 02 Section "Selective Structure Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements, and for disposition of hazardous waste.
5. Division 04 Section "Unit Masonry" for disposal requirements for masonry waste.
6. Division 04 Section "Stone Masonry" for disposal requirements for excess stone and stone waste.
7. Division 31 Section "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

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 PERFORMANCE GOALS

A. General: Develop waste management plan that results in end-of-Project rates for recycling of 75 percent by weight of total waste, excluding alternative daily cover as a diverted waste but include as landfill waste, generated by the Work.

B. Recycle Goals: Owner's goal is to recycle as much nonhazardous demolition and construction waste as possible including the following materials:

1. Demolition Waste:

a. Asphaltic concrete 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. Rough hardware.

l. Roofing.

m. Insulation.

n. Doors and frames.

o. Door hardware.

p. Windows.

q. Glazing.

r. Gypsum board.

s. Acoustical tile and panels.

t. Carpet.

u. Carpet pad.

v. Equipment.

w. Cabinets.

x. Plumbing fixtures.

y. Piping.

z. Supports and hangers.

aa. Valves.

bb. Sprinklers.

cc. Mechanical equipment.

dd. Refrigerants.

ee. Electrical conduit.

ff. Copper wiring.

gg. Lighting fixtures.

hh. Lamps.

ii. Ballasts.

jj. Electrical devices.

kk. Switchgear and panelboards.

ll. 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 recycle goal indicated above, 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.

1.5 SUBMITTALS

A. Waste Management Plan: Submit 3 copies of plan within 7 days of date established for the Notice to Procced.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit one copy of the report. Include at least four different material streams and exclude land-clearing debris from the calculation. Include the following information:

1. Four material category.

2. Generation point of waste.

3. Total quantity of waste in tons.

4. Quantity of waste recycled, both estimated and actual in tons.

5. Total quantity of waste recycled in tons.

6. Total quantity of waste recycled as a percentage of total waste.

C. Waste Reduction Calculations: Before request for Substantial Completion, submit one copy of the calculated end-of-Project rates for recycling and disposal as a percentage of total waste generated by the Work.

D. 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.

E. 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.

F. Qualification Data: For Waste Management Coordinator and refrigerant recovery technician.

G. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.6 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: LEED Accredited Professional by U.S. Green Building Council. Waste management coordinator may also serve as LEED coordinator.

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: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.

2. Review requirements for documenting quantities of each type of waste and its disposition.

3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.

4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.

5. Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight (tons).

B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be recycled or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.

2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

3. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Cost/Revenue Analysis: 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. Include the following:

1. Total quantity of waste.

2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.

3. Total cost of disposal (with no waste management).

4. Revenue from recycled materials.

5. Savings in hauling and tipping fees by donating materials.

6. Savings in hauling and tipping fees that are avoided.

7. Handling and transportation costs. Include cost of collection containers for each type of waste.

8. Net additional cost or net savings from waste management plan.

E. Forms: Prepare waste management plan on forms included at end of Part 3.

2. PART 2 PRODUCTS

(Not Used)

3. PART 3 EXECUTION

1.8 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Construction Manager. 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 Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three days of submittal return.

2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for recycling and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be recycled.

2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

1.9 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
   a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.

4. Store components off the ground and protect from the weather.

5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

1.10 RECYCLING DEMOLITION WASTE

A. Asphaltic Concrete Paving: Grind asphalt to maximum 1-1/2-inch (38-mm) or 4-inch (100-mm) size.

1. Crush asphaltic concrete paving and screen to comply with requirements in Division 31 Section "Earth Moving" for use as general fill.

B. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.

C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 1-1/2-inch (38-mm) or 4-inch (100-mm) size.

2. Crush concrete and screen to comply with requirements in Division 31 Section "Earth Moving" for use as satisfactory soil for fill or subbase.

D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Pulverize masonry to maximum 1-1/2-inch (38-mm) or 4-inch (100-mm) size.

a. Crush masonry and screen to comply with requirements in Division 31 Section "Earth Moving" for use as general fill or satisfactory soil for fill or subbase.

b. Crush masonry and screen to comply with requirements in Division 32 Section "Plants" for use as mineral mulch.

2. Clean and stack undamaged, whole masonry units on wood pallets.

E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

F. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.

2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

H. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.

J. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

K. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

L. Plumbing Fixtures: Separate by type and size.

M. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

N. Lighting Fixtures: Separate lamps by type and protect from breakage.

O. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

P. Conduit: Reduce conduit to straight lengths and store by type and size.

1.11 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.

2. Polystyrene Packaging: Separate and bag materials.

3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.

4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees are to be excluded from the calculation.

1. Comply with requirements in Division 32 Section "Plants" for use of chipped organic waste as organic mulch.

C. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.

2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

a. Comply with requirements in Division 32 Section "Plants." for use of clean sawdust as organic mulch.

D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

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

a. Comply with requirements in Division 32 Section "Plants." for use of clean ground gypsum board as inorganic soil amendment.

1.12 DISPOSAL OF WASTE

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

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

B. Burning: Do not burn waste materials.

C. Burning: 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.

D. Disposal: Transport waste materials and dispose of at designated spoil areas on Owner's property.

E. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Closeout Procedures.

B. Final Cleaning.

C. Pest Control.

D. Adjusting.

E. Demonstration and Instructions.

F. Project Record Documents.

G. Operation and Maintenance Data.

H. Warranties.

I. Spare Parts and Maintenance Materials.

J. Commissioning.

1.2 PROJECT CLOSEOUT CONFERENCE

A. As specified under Section 01 31 00.

1.3 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect's review.

B. Prepare and submit to Architect a list of items to be completed or corrected, the value of the items on the list, and reasons why the Work is not complete.

C. Submit written request to Architect for review of Work.

D. Submit warranties, bonds, service agreements, certifications, record documents, maintenance manuals, receipt of spare parts and similar closeout documents.

E. Make final changeover of permanent locks and deliver keys to Owner.

F. Terminate and remove temporary facilities from Project site.

G. Advise Owner of change over in heat and other utilities.

H. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

I. Submit affidavit of payment of debts and claims, AIA Document G706.

J. Submit affidavit of release of liens, AIA Document G706A.

K. Submit consent of contractors surety to final payment, AIA Document G707.

L. Owner will occupy all of the building as specified in Section 01 11 00.

1.4 REGULATORY REQUIREMENTS

A. Provide submittals to Architect that are required by governing or other authority.

1.5 FINAL CLEANING

A. Execute final cleaning prior to final review by Architect.

B. Employ experienced professional cleaners for final cleaning.

C. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces.

D. Vacuum carpeted and soft surfaces. Shampoo if visible stains exist.

E. Clean equipment and plumbing fixtures to a sanitary condition.

F. Clean exposed surfaces of grilles, registers and diffusers.

G. Replace filters of operating mechanical equipment.

H. Clean debris from roofs, gutters, downspouts, and drainage systems.

I. Clean site; sweep paved areas, rake clean landscaped surfaces.

J. Remove waste and surplus materials, rubbish, and construction facilities from the site.

K. Clean light fixtures and replace burned out lamps and bulbs.

L. Replace defective and noisy ballasts and starters in fluorescent fixtures.

M. Leave project clean and ready for occupancy by Owner.

1.6 PEST CONTROL

A. Engage an experienced, licensed exterminator to make final inspection and rid Project of rodents, insects, and other pests. Submit final report to Architect.

1.7 ADJUSTING

A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.8 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products, systems, and equipment to Owner's personnel two weeks prior to date of final review.

B. For each demonstration submit list of participants in attendance.

C. Provide link of each demonstration and instructions session.

D. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

F. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at equipment location.

G. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

1.9 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following record documents; record actual revisions to the Work in contrasting color.

1. Contract Drawings.

2. Specifications.

3. Addenda.

4. Change Orders and other Modifications to the Contract.

5. Reviewed shop drawings, product data, and samples.

B. Store Record Documents separate from documents used for construction.

C. Record information concurrent with construction progress.

D. Specifications: Legibly mark and record at each Product Section in contrasting color ink, description of actual Products installed, including the following:

1. Manufacturer's name and product model and number.

2. Supplier and installer’s name and contact information.

3. Changes made by Addenda and Modifications.

E. Contract Drawings and Shop Drawings: Legibly mark each item in contrasting color ink to record actual construction including:

1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

3. Field changes of dimension and detail.

4. Details not on original Contract Drawings.

5. Revisions to electrical circuitry and locations of electrical devices and equipment.

6. Note change orders, alternate numbers, and similar information, where applicable.

F. Identify each record drawing with the written designation of “RECORD DRAWING” located in prominent location.

G. Record Digital Data Files: Immediately before inspection for Substantial Completion, review marked-up record prints with Architect and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Annotated PDF electronic file with comment function enabled.

2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.

3. Refer instances of uncertainty to Architect through Construction Manager for resolution.

4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.

   (a) Refer to Section 01 33 00 “Submittal Procedures” for requirements related to use of Architect's digital data files.

H. Final Property Survey: Under the provisions of Section 01 73 00.

I. Record Construction Schedule: Under the provisions of Section 01 32 00.

J. Submit documents to Architect at time of Substantial Completion.

1.10 OPERATION AND MAINTENANCE DATA

A. Summary:

1. Organize operation and maintenance data with directory.

2. Provide operation and maintenance manuals for products, systems, subsystems, and equipment.

3. Refer to Divisions 02 thru 49 for specific operation and maintenance manual requirements for the Work in those Divisions.

B. Submit two sets prior to final review, bound in 8-1/2 inch x 11 inch, three ring D size binders with durable vinyl covers.

C. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.

D. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with laminated plastic tabs.

E. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Engineers, Contractor, subcontractors, and major equipment suppliers and manufacturers.

F. Part 2: Operation and maintenance instructions, arranged by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:

1. Performance and design criteria.

2. List of equipment.

3. Parts list for each component.

4. Start-up procedures.

5. Shutdown instructions.

6. Normal operating instructions.

7. Wiring diagrams.

8. Control diagrams.

9. Maintenance instructions for equipment and systems.

10. Maintenance instructions for finishes, including recommended cleaning methods and materials.

G. Part 3: Project documents and certificates, including the following:

1. Shop drawings and product data.

2. Air and water balance reports.

3. Certificates.

4. Warranties.

H. Refer to Section 01 91 13 - General Commissioning Requirements, for additional requirements.

1.11 WARRANTIES

A. Commencement of warranties shall be date of Substantial Completion.

B. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

C. Provide duplicate notarized copies in operation and maintenance manuals.

D. Execute and assemble documents from subcontractors, suppliers, and manufacturers.

E. Provide Table of Contents and assemble in binder with durable plastic cover.

F. Submit prior to final Application for Payment.

G. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of warranty on the work that incorporates the products.

H. Manufacturer's disclaimer and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with Contractor.

I. When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

J. When work covered by warranty has failed and has been corrected, reinstate warranty by written endorsement. Reinstated warranty shall be equal to original warranty with equitable adjustment for depreciation.

K. Upon determination that Work covered by warranty has failed, replace or repair Work to an acceptable condition complying with requirements of the Contract Documents.

1.12 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.

B. Deliver to Project site and place in location as directed.

C. Obtain signed receipt for delivery of materials and submit prior to request for final review by Architect.

1.13 COMMISSIONING

A. All commissioning work as specified in Section 01 91 13 must be complete prior to Substantial Completion.

B. Exceptions to commissioning work being complete prior to Substantial Completion are planned control system training performed after occupancy and any required seasonal testing or deferred testing.

C. Commissioning activities are non-compensable and cannot be a cause for a delay claim.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 81 13

SUSTAINABLE DESIGN REQUIREMENTS

1. PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes general requirements and procedures for compliance with certain prerequisites and credits needed for Project to obtain "LEED Version 4 for Building Design and Construction" (LEED v4 BD+C) Gold certification based on USGBC's LEED v4 BD+C. the following document may reference LEED Version 4.1 for Building Design and Construction" (LEED v4.1 BD+C) as substitution are allowed on a credit basis.

1. Specific requirements for LEED are also included in other Sections and encompass products in Sections 3-10, 22 07 19, 22 08 00, 22 34 00 – 22 43 23, 23 07 13, 23 08 00, 23 81 26, 23 81 29, 26 08 00, 26 31 00, 32 12 16, 32 13 13, 32 80 00, etc. (as applicable).

2. Some LEED prerequisites and credits needed to obtain LEED certification depend on product selection and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.

3. A copy of the LEED Project checklist is attached at the end of this Section for information only.

a. Some LEED prerequisites and credits needed to obtain the indicated LEED certification depend on aspects of Project that are not part of the Work of the Contract.

4. Definitions included in the "LEED Version 4.1 for Building Design and Construction" (LEED v4.1 BD+C) Reference Guide and online amendments apply to this Section.

B. Related Requirements:

1. Section 01 57 31, "Indoor Air Quality Management."

2. Section 01 74 19, "Construction Waste Management and Disposal."

3. Divisions 02 through 49 Sections for LEED requirements specific to the work of each of these Sections. Requirements may or may not include reference to LEED.

1.03 DEFINITIONS

A. Bio-Based Materials: Materials that meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials shall be tested using ASTM D 6866 or equivalent method ISO 16620-2 or be certified to the USDA BioPreferred Voluntary Labeling Initiative that includes verification via ASTM 6866 testing.

B. CDPH Standard Method v1.2: California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v1.2–2017, for the emissions testing and requirements of products and materials.

C. Chain-of-Custody (COC): A procedure that tracks a product from the point of harvest or extraction to its end use, including all successive stages of processing, transformation, manufacturing, and distribution.

D. Chain-of-Custody Certificates: Certificates signed by manufacturers and fabricators certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001.

E. Composite Wood and Agrifiber: Products made of wood particles and/or plant material pressed and bonded with adhesive or resin such as particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores.

F. Corporate Sustainability Report: A third-party verified report that outlines the environmental impacts of extraction operations and activities associated with the manufacturer's product and the product's supply chain.

G. Environmental Product Declaration (EPD): An independently verified report based on life-cycle assessment studies that have been conducted according to a set of common rules for each product category and peer-reviewed.

1. Products with publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product specific Type III EPD – Industry Reviewed. Products with an internally critically reviewed LCA in accordance with ISP

3. 14071. Products with product specific internal EPDs which conform to ISO 14025 and EN 15840 or ISO 21930 and have at least a cradle to gate scope.

4. Industry-wide Type III EPD. Products with third-party certification (Type III), including external verification, in which the manufacture is explicitly recognized as a participant by the program operator. Products with industry wide EPDs, which conform to ISO 14025 and EN 1580Aor ISO 21930 and have at least a cradle to gate scope.

5. Product-Specific Type III EPD. Products with third-party certification (Type III), including external verification and external critical review in which the manufacture is explicitly recognized as a participant by the program operator conforming to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

H. Extended Producer Responsibility (EPR): Measures undertaken by the maker of a product to accept its own and sometimes other manufacturers' products as postconsumer waste at the end of the products' useful life.

I. Health Product Declaration Open Standard (HPD): A standard format for reporting product content and associated health information for building products and materials.

J. Indoor Air Quality (IAQ) Management Plan: Plan developed by the Contractor to provide a healthy indoor environment for workers and building occupants during construction. Plan must meet or exceed the recommendations of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) "IAQ Guidelines for Occupied Buildings Under Construction."

K. Leadership Extraction Practices: Products that meet at least one of the responsible extraction criteria, which include: extended producer responsibility; bio-based materials; FSC wood products; materials reuse; recycled content; and other USGBC approved programs.

L. Material Cost: The dollar value of materials being provided to the site, after Contractor mark-ups, including transportation costs, taxes, fees, and shop labor, but excluding field equipment and field labor costs.

M. Materials Reuse: Reuse includes salvaged, refurbished, or reused products.

N. Multi-Attribute Optimization: Third party certified products that demonstrate impact reduction below industry average in at least three of the following six categories: global warming potential; stratospheric ozone depletion; acidification; eutrophication; tropospheric ozone creation; nonrenewable resource depletion.

O. Recycled Content: Recycled content is the sum of postconsumer recycled content plus one-half the preconsumer recycled content, based on cost.

1. "Postconsumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.

2. "Preconsumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials, such as rework, regrind, or scrap, generated in a process and capable of being reclaimed within the same process that generated it.

P. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 100 miles from the Project site.

Q. Volatile Organic Compounds (VOC) Emissions Test: Refer to CDPH Standard Method v1.2 definition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Work of this project includes completed building and application for LEED certification. Work is not complete until Owner has accepted USGBC's final review of LEED certification.

1. Provide documentation required by LEED and LEED review.

B. Provide materials and procedures necessary to obtain LEED prerequisites and credits required in this Section. Other Sections may specify requirements that contribute to LEED prerequisites and credits. Refer to other sections for additional materials and procedures necessary to obtain LEED prerequisites and credits.

C. Respond to questions and requests for additional information from Architect and the USGBC regarding LEED credits until the USGBC has made its determination on the project's LEED certification application.

D. LEED Online Submittals: Provide Green Dinosaur with LEED documentation submittal data for review. Complete online forms at least monthly and as necessary to document LEED credits for submittals required in this Section.

E. Sustainability Pre-Construction Work Session: Schedule a conference at a time convenient to Contractor(s) within 21 days prior to commencement of the work. Advise Architect, Owner(s), and Commissioning Authority of scheduled meeting dates.

1. Attendees: Authorized representatives of General Contractor and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: LEED goals for the project, Contractor's action plans, and discussion of targeted LEED Prerequisites and Credits.

3. Minutes: Record and distribute minutes to attendees and other entities with responsibilities for obtaining LEED Credits.

1.05 ACTION SUBMITTALS

A. General: Submit additional LEED submittals required by other Specification Sections 3-10, 22 07 19, 22 08 00, 22 34 00-22 43 23, 23 07 13, 23 08 00, 23 81 26, 23 81 29, 26 08 00, 26 31 00, 32 12 16, 32 13 13, 32 80 00, etc. (as applicable).

1. Submit each LEED submittal simultaneously with applicable product submittal.

2. Provide monthly photographs of the Erosion and Sedimentation Controls Plan strategies showing that the measures have been installed and are being maintained throughout the course of the project.

B. LEED Documentation Submittals:

1. General, Sustainable Submittal Intake Form: Project submittals must be accompanied by a completed Sustainable Submittal Intake Form. Submittal packages must also include highlighted documentation supporting the sustainability claims made on the Sustainable Submittal Intake Form.

2. EAp, Building-Level Energy Metering: Product data for meters, sensors, and data collection system used to provide continuous metering of building energy-consumption performance

3. EAc, Advanced Energy Metering: Product data for sub-meters, sensors, and data collection system used to provide continuous metering for the whole building and for any individual energy with an end use that equates to 10% of the total annual consumption of the building.

4. MRp/MRc, Construction and Demolition Waste Management: Comply with submittal requirements of Section 01 74 19 "Construction Waste Management and Disposal."

5. MRc, Environmental Product Declarations (LEED v4.1 BD+C) complying with LEED requirements.

6. MRc, Sourcing of Raw Materials (LEED v4.1 BD+C)

   a. Extended Producer Responsibility: Product data and certification letter from product manufacturers, indicating participation in an extended producer responsibility program and statement of costs.

   b. Bio-Based Materials: Product data and certification for bio-based materials, indicating that they comply with requirements. Include statement of costs.

   c. Certified Wood: Product data and chain-of-custody certificates for products containing Forest Stewardship Council (FSC) certified wood. Include statement indicating cost for each certified wood product.

   d. Material Reuse. Reuse includes salvaged, refurbished, or reused products.

   e. Recycled Content: Product data and certification letter from product manufacturers, indicating percentages by weight of postconsumer and preconsumer recycled content for products having recycled content. Additionally, include the following:

      1) Provide the hard cost of materials excluding labor

      2) Provide location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material.

7. MRc, Material Ingredients: Option 1, Material Ingredient Reporting (LEED v4.1 BD+C)

   a. Material ingredient reports for products that comply with LEED requirements for material ingredient reporting, including but not limited to the following:

      1) Manufacturer Inventory. The manufacture has published complete content inventory for the product following LEED v4.1 BD+C Material Ingredients guidelines.

      2) Health Product Declaration (HPD). The end use product has a published a complete HPD with full disclosure of known hazards in compliance with the HPD open Standard.

      3) Cradle to Cradle certifications. Product has Material Health Certificate or is Cradle to Cradle Certified under standard version 3 or later with Material Health achievement level at the Bronze level or higher.

4) Declare product labels. The Declare product label must be Red List Free, LBC Red List Free, or Declared. Declare labels designated as LBC Complaint that demonstrate content inventory to 0.1% (1000 ppm).

5) ANSI/BIFMA e3 Furniture Sustainability Standard. The documentation from the assessor or scorecard form BIFMA must demonstrate the product earned at least 3 points under 7.5.1.3 Advanced Level in e3-2014 or 3 points under 7.4.1.3 Advanced Level in e3-2012.

6) Product Lens Certification.

7) Facts – NSF/ANSI 336: Sustainability Assessment for Commercial Furnishings Fabric at any certification level.

8) Global Green TAF PHD labels issued after January 1, 2020.

9) Living Product Challenge. The included Declare product label must demonstrate content inventory to 0.1% (1000 ppm).

8. EQp/EQc, Indoor Air Quality: Comply with submittal requirements of Section 01 57 31, "Indoor Air Quality Management."

9. EQc, Low-Emitting Materials: Product data, indicating VOC content and emissions testing documents showing compliance with requirements for low-emitting materials, for the following materials:

a. Paints and coatings.

b. Adhesives and sealants.

c. Flooring.

d. Products containing composite wood or agrifiber products or wood glues.

e. Ceilings, walls, thermal, and acoustic insulation.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For LEED coordinator.

B. Project Materials Cost Data: Provide statement indicating total cost and shop labor for materials used for Project. Costs exclude site labor, overhead, and profit. Include breakout of costs for the following categories of items:

1. Division 03 – CONCRETE, Division 04 – MASONRY, Division 05 – METALS, Division 06 – WOOD PLASTICS AND COMPOSITES, Division 07 – THERMAL AND MOISTURE PROTECTION, Division 08 – OPENINGS, Division 09 – FINISHES, Division 10 – SPECIALTIES, as applicable.

2. Sections 31 60 00, 32 10 00, 32 60 00, 32 90 00, as applicable.

C. LEED Action Plan Components: Provide preliminary submittals within 7 days of date established for the Notice to Proceed including how the following requirements will be met:

1. MRp/MRc, Waste management plan, complying with Section 01 74 19 "Construction Waste Management and Disposal."

2. EQp/EQc, Indoor air quality plan, complying with Section 01 57 31, "Indoor Air Quality Management."

D. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:

1. MRp/MRc, Waste reduction progress reports complying with Section 01 74 19 "Construction Waste Management and Disposal."

2. MRc, Environmental Product Declaration (LEED v4.1 BD+C)

3. MRc, Sourcing of Raw Materials (LEED v4.1 BD+C)

    a. General: Manufacturing locations.

    b. Extended producer responsibility.

    c. Bio-based materials.

    d. Certified wood products.

    e. Materials reuse.

    f. Recycled content.

4. MRc, Material Ingredients (LEED v4.1 BD+C)

    a. Manufacture Inventory.

    b. Health Product Declaration (HPD).

    c. Cradle to Cradle.

    d. Declare.

    e. Living Product Challenge.

    f. ANSI/BIFMA e3 Furniture Sustainability Challenge.

    g. Product Lens Certification.

    h. Facts – NSF/ANSI 336.

    i. Global Green TAG PHS labels.

5. EQc, Low emitting materials (LEED v4.1 BD+C).

    a. Low Emitting Materials Tracking Sheet monitoring the project’s progress towards targeted LEED Indoor Environmental Quality Credits. Tracking Sheet to be presented at construction meetings.

6. EQc, Indoor air quality, during construction, complying with Section 01 57 31, "Indoor Air Quality Management."

1.07 QUALITY ASSURANCE

A. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

2. PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated. Contractor to determine a combination of credit options best suited for achieving credits required.

1. Exclusions: Special equipment, such as elevators, escalators, process equipment, and fire suppression systems, is excluded from the credit calculations. Also excluded are products purchased for temporary use on the project, like formwork for concrete.

2.02 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION

A. MRc, Environmental Product Declarations (EPD) (LEED v4.1 BD+C): Option 1. Provide at least 20 permanently installed products (sourced from at least 5 different manufacturers) which meet one of the disclosure criteria:

1. Life-cycle assessment: Valued as one whole product.

2. Product-Specific Type III EPD (Internally Reviewed): Valued as one whole product.

3. Industry-Wide Type III EPD (Externally Verified): Valued as one whole product.

4. Product-Specific Type III EPD (Externally Verified): Valued as 1.5 products.

B. MRc, Sourcing of Raw Materials (LEED v4.1 BD+C). Provide products (sourced from at least 3 different manufacturers) that meet at least one of the responsible extraction criteria below for at least 15%, by cost, of the total value of permanently installed building products in the project:

1. Extended producer responsibility program.

2. Bio-Based Materials.

3. Certified Wood: Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:

a. Rough carpentry.

b. Miscellaneous carpentry.

c. Heavy timber construction.

d. Wood decking.

e. Metal-plate-connected wood trusses.

f. Structural glued-laminated timber.

g. Finish carpentry.

h. Architectural woodwork.

i. Wood paneling.

j. Wood veneer wall covering.

k. Wood flooring.

l. Wood lockers.

m. Wood cabinets.

n. Furniture – as applicable.

4. Materials reuse.

5. Recycled content.

a. Exceptions: Do not include fire protection, operational plumbing, operational mechanical, and operational electrical components, and specialty items, such as elevators and equipment, in the calculation.

C. MRc, Material Ingredients (LEED v4.1 BD+C): Option 1, Material Ingredient Reporting.

1. Use at least 20 different permanently installed products (sourced from at least five different manufacturers) that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

a. Manufacturer Inventory.

b. Health Product Declarations (HPDs).

c. Cradle to Cradle (C2C) certifications.

d. Declare product labels.

e. Living Product Challenge.

f. ANSI/BIFMA e3 Furniture Sustainability Standard.

g. Facts – NDF/ANSI 336.

h. Global Green TAG PHD.

i. Product Lens Certification

2.03 LOW-EMITTING MATERIALS

A. EQc, Low-Emitting Materials (LEED v4.1 BD+C), General Emissions Requirements: Products must demonstrate they have been tested and determined compliant in accordance with California Department of Public Health, (CDHP), Standard Method v1.2-2017, using the applicable exposure scenario. Manufacturer's documentation demonstrating compliance must state the range of total VOCs (tVOC) after 14 days measured as specified in the CDPH Standard Method v1.2 as follows:

1. 0.5mg/m3 or less,

2. between 0.5 and 5.0 mg/m3 or,

3. 0.50 mg/m3 or more.

B. EQc, Low-Emitting Materials, Paints and Coatings (LEED v4.1 BD+C): For field applications that are inside the weatherproofing system, use paints and coatings that comply with the limits for VOC content when calculated according to the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective February 5, 2016.

Product Type:	Allowable VOC Content (g/L):
Bond Breaker	350
Clear wood finishes - Varnish	150
Clear wood finishes – Sanding Sealer	150
Clear wood finishes - Lacquer	550
Colorant – Architectural Coatings, excluding IM coatings	50
Colorant – Solvent Based IM	600
Colorant - Waterborne IM	50
Concrete – Curing compounds	100
Concrete – Curing compounds for roadways & bridges	350
Concrete surface retarder	50
Driveway Sealer	50

Dry-fog coatings	50
Faux finishing coatings - Clear topcoat	100
Faux finishing coatings – Decorative Coatings	350
Faux finishing coatings - Glazes	350
Faux finishing coatings - Japan	350
Faux finishing coatings – Trowel applied coatings	50
Fire-proof coatings	150
Flats	50
Floor coatings	50
Form release compounds	100
Graphic arts (sign) coatings	200
Industrial maintenance coatings	100
Industrial maintenance coatings – High temperature IM coatings	420
Industrial maintenance coatings – non-sacrificial anti-graffiti coatings	100
Industrial maintenance coatings – Zinc rich IM primers	100
Magnesite cement coatings	450
Mastic coatings	100
Metallic pigmented coatings	150
Multi-color coatings	250
Non-flat coatings	50
Pre-treatment wash primers	420
Primers, sealers, and undercoats	100
Reactive penetrating sealers	350
Recycled coatings	250
Roof coatings	50
Roof coatings, aluminum	100
Roof primers, bituminous	350
Rust preventative coatings	400
Stone consolidants	450
Sacrificial anti-graffiti coatings	50
Shellac- Clear	730
Shellac – Pigmented	550
Specialty primers	100
Stains	100
Stains, interior	250
Swimming pool coatings – repair	340
Swimming pool coatings – other	340
Traffic Coatings	100
Waterproofing sealers	100
Waterproofing concrete/masonry sealers	400
Wood preservatives	350
Low solids coatings	120

C. EQc, Low-Emitting Materials, Adhesives and Sealants (LEED v4.1 BD+C): For field applications that are inside the weather proofing system, use adhesives and sealants that comply with the limits for VOC content when calculated according to South Coast Air Quality Management District (SCAQMD) Rule #1168, requirements in effect on October 6, 2017:

Architectural Applications:	Allowable VOC Content (g/L):
All other indoor floor covering adhesives	50
Carpet pad adhesives	50
All other outdoor floor covering adhesives	50
Wood flooring adhesives	100
Rubber floor adhesives	60
Subfloor adhesives	50
Ceramic glass, porcelain, & stone tile adhesives	65
VCT and asphalt tile adhesives	50

Dry wall and panel adhesives	50
Cove base adhesives	50
Multipurpose construction adhesives	70
Structural glazing adhesives	100
Roofing - Single ply membrane adhesives	250
Specialty Applications:	
PVC welding	510
CPVC welding	490
ABS welding	325
Plastic cement welding	250
Plastic adhesive primers	550
Computer diskette manufacturing adhesive	350
Contact adhesive	80
Special purpose contact adhesive	250
Tire tread adhesive	100
Traffic marking tape adhesive primers	150
Structural wood member adhesive	140
Sheet applied rubber lining operations specialty	850
Top and Trim adhesive	250
Substrate Specific Applications:	
Metal substrate specific adhesive	30
Plastic foam substrate specific adhesive	50
Porous material (except wood) substrate specific adhesives	50
Wood substrate specific adhesives	30
Fiberglass substrate specific adhesive	80
Sealants:	
All other architectural sealant	50
Marine deck sealant	760
Nonmember roof sealant	300
Roadway sealant	250
Roofing - Single-ply roof membrane sealant	450
Roofing – all other roof sealants	300
Sealant Primers:	
Architectural non-porous sealant primer	250
Architectural porous sealant primer	775
Modified bituminous sealant primer	500
Marine deck sealant primer	760
All other sealant primer	750
Other	
Other adhesives, adhesive bonding primers, adhesive primers, or any other primers	250

1. Exception: The provisions of SCAQMD Rule 1168 do not apply to adhesives and sealants subject to state or federal consumer product VOC regulations.

D. EQc, Low-Emitting Materials, Flooring (LEED v4.1 BD+C): Flooring shall comply with the requirements of the California Department of Public Health's (CDPH) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

E. EQc, Low-Emitting Materials, Composite Wood (LEED v4.1 BD+C): Composite wood, agrifiber products, and adhesives shall be made using ultra-low-emitting formaldehyde (ULEF) resins as defined in the California Air Resources Board's (CARB) "Airborne Toxic Control Measure (ATCM) to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.

F. EQc, Low-Emitting Materials, Ceilings, Walls, Thermal, and Acoustic Insulation (LEED v4.1 BD+C): Ceilings, walls, and thermal insulation shall comply with the requirements of the California Department of Public Health's (CDPH) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

G. EQc, Low-Emitting Materials, Ceilings (LEED v4.1 BD+C): Ceiling products, including all ceiling panels, ceiling tile, surface ceiling structures such as gypsum or plaster, suspended systems (including canopies and clouds), and glazed skylights, shall comply with the requirements of the California Department of Public Health's (CDPH) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

H. Additional Low-Emitting Requirements:

1. Statement of product compliance must be made by the manufacturer or a USGBC-approved third-party. Any testing must follow the test method specified in the applicable regulation. Any testing must follow the test method specified in the applicable regulation. Laboratories that conduct tests must be accredited under ISO/IEC 17025 for the test methods used. Organizations that certify manufacturers' claims must be accredited under ISO/IEC 17065.

2. If the applicable regulation requires subtraction of exempt compounds, any content of intentionally added exempt compounds larger than 1% weight by mass (total exempt compounds) must be disclosed.

3. Methylene chloride and perchloroethylene may not be intentionally added in paints, coatings, adhesives, or sealants.

2.04 INDOOR WATER USE REDUCTION

A. WEp, Indoor Water Use Reduction, Appliances: Provide ENERGY STAR or performance equivalent appliances. All water fixtures, fittings and aerators are to be WaterSense labeled as applicable.

B. WEp/WEc, Indoor Water Use Reduction, Plumbing Fixtures: Do not exceed water flow requirements indicated in Division 22 – PLUMBING and/or plans, whichever is more stringent.

3. PART 3 EXECUTION

3.01 NONSMOKING BUILDING

A. EQp, Environmental Tobacco Smoke Control: Smoking is not permitted within the building or within 25 feet (8 m) of all entrances, operable windows, or outdoor-air intakes.

1. Refer to Section 01 57 31, "Indoor Air Quality Management."

3.02 CONSTRUCTION WASTE MANAGEMENT

A. MRp/MRc, Construction and Demolition Waste Management: Comply with Section 01 74 19 "Construction Waste Management and Disposal."

3.03 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. EQp/EQc, Construction Indoor Air Quality Management Plan: Comply with Section 01 57 31, "Indoor Air Quality Management."

END OF SECTION

SECTION 01 91 13

GENERAL COMMISSIONING REQUIREMENTS

1. PART 1 GENERAL

1.1. RELATED DOCUMENTS

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

B. Owners Project Requirements (OPR) and Basis of Design (BoD) documentation are included by reference for information only.

1.2. SUMMARY

A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components. Commissioning will be completed to meet the requirements of 2022 California Green Building Code ("CALGreen") and LEED™ Rating System, Version 4.

B. Commissioning is a systematic process to provide documented confirmation that building systems perform according to the criteria set forth in the design intent and satisfy the owner's operational needs. This is achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance and the warranty period with actual verification of performance.

C. Commissioning requires cooperation and involvement of all parties throughout the construction process. The Contractor shall deliver a successful Commissioning process. Successful Commissioning requires that installation of all building systems complies with Contract Document requirements and that full operational check-out and necessary adjustments are performed prior to Substantial Completion, with the exception of deferred tests approved in advance by Owner.

D. Commissioning will encompass and coordinate traditionally separate functions of system documentation, installation checkout, equipment startup, Prefunctional Checklists aka construction checklists, control system calibration and point-to-point checkout, testing, adjusting, and balancing, trending report, Functional Performance Tests, Contractor demonstration to the Owner, and training of Owner's personnel. This requires assembling all related documentation into one cohesive collection. Commissioning is intended to achieve the following specific objectives of the Contract Documents:
   1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
   2. Verify and document proper performance of equipment and systems.
   3. Verify that O&M documentation left on site is complete.
   4. Verify that the Owner's operating personnel are adequately trained.

E. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

F. Abbreviations. The following are common abbreviations used in the Specifications and in the Commissioning Plan. Definitions are found in Section 1.3.

A/E-	Architect and design engineers	GC-	General contractor (prime)
CxA-	Commissioning authority	MC-	Mechanical contractor
CC-	Controls contractor	OR-	Owner's Representative
Cx-	Commissioning	PC-	Prefunctional checklist

Cx Plan-	Commissioning Plan document	PCtr-	Plumbing contractor
EC-	Electrical contractor	Subs-	Subcontractors to General
FT-	Functional performance test	TAB-	Test and balance contractor

G. Related Sections:

1. Section 22 08 00 Commissioning of Plumbing Systems
2. Section 23 08 00 Commissioning of HVAC Systems
3. Section 26 08 00 Commissioning of Electrical Systems

2. DEFINITIONS

A. Acceptance Phase: Phase of construction after start-up and initial checkout when functional performance tests, O&M documentation review and training occurs.

B. Acceptance Phase Approval: Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.

C. Acceptance Test Certificate: Documentation from a certified Acceptance Test Technician verifying the performance of equipment installed on nonresidential buildings as required by section 10-103-A and 10-103-B of the 2022 Building Energy Efficiency Standards.

D. Acceptance Test Technician: Building specialists, trained and certified by state approved agencies to conduct acceptance tests and submit results and certificates to enforcement agencies.

E. Building Automation System: System and components associated with the Building Automation System.

F. BoD: Basis of Design: A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

G. Building Automation System: System and components associated with the Building Automation System.

H. Commissioning: A systematic process confirming that building systems have been installed, properly started, and consistently operated in strict accordance with the Contract Documents, that all systems are complete and functioning in accordance with the Contract Documents at Substantial Completion, and that Contractor has provided Owner adequate system documentation and training. Commissioning includes deferred and/or seasonal tests as approved by Owner.

I. Commissioning Authority (CxA): Party having a contractual agreement with the Owner to provide third party commissioning services as defined herein under Commissioning Authority's Role and Responsibilities.

J. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

K. Commissioning Process: A quality-focused process for enhancing the delivery, performance, and sustainability of commissioned systems on a project. The process focuses upon verifying and documenting that these systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the owner's project requirements.

L. Commissioning Team: Working group made up of representative(s) from the Architect/Engineer, Contractor, MEP subcontractors, Test, Adjust, and Balance Firm, Controls Contractor, Building Automation System vendor, specialty manufacturers and suppliers, Owner, and Commissioning Authority.

M. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents.

N. Factory Testing: Testing of equipment on-site or at the factory by factory personnel with an Owner's representative present.

O. Functional Performance Test (FT): Test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FTs are performed after completion of the trending report acceptance, TAB report EOR approval, and prefunctional checklists and startup checkout procedures.

P. Functional Performance Test Procedures: Commissioning protocols and detailed test procedures and instructions in tabular and script-type format that fully describe system configuration and steps required to determine if the system is performing and functioning properly.

Q. Integrated System Test: Test of dynamic function and operation of multiple systems. Integrated System Tests are tested under various modes, such as thermal energy storage change-over, power failure, etc. Systems are integrally operated through all specified sequences of operation. Components are verified to be responding in accordance with Contract Documents. Integrated System Tests are executed after Functional Performance Tests are complete and prior to Substantial Completion. Integrated System Tests provide verification that the integrated systems will properly function according to the Contract Documents.

R. Integrated System Test Procedures: Commissioning protocols and detailed test procedures and instructions in tabular and script-type format that fully describe system configurations and steps required to determine if the interacting systems are performing and functioning properly.

S. General Contractor (GC): The prime contractor for this project. Generally refers to all the GC's subcontractors as well. Also referred to as the Contractor, in some contexts.

T.Indirect Indicators: Indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed

U. Manual Test: Using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

V. Monitoring: The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.

W. Non-Compliance: See Deficiency.

X. Non-Conformance: See Deficiency.

Y. Over-written Value: Writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."

Z.OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

AA. Prefunctional Checklist (PC): Referred to as construction checklists. A list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CxA to the Sub. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some prefunctional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The word prefunctional refers to before functional testing. Prefunctional checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, contractors typically perform some, if not many, of the prefunctional checklist items a commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for most equipment, the contractors execute the checklists on their own. The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the prefunctional checklisting, except for larger or more critical pieces of equipment.

BB. Sampling: Functionally testing only a fraction of the total number of identical or near identical pieces of equipment.

CC. Seasonal Performance Tests: FT that are deferred until the system(s) will experience conditions closer to their design conditions.

DD. Simulated Condition: Condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

EE. Simulated Signal: Disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.

FF. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

GG. Startup: The initial starting or activating of dynamic equipment, including executing prefunctional checklists. Start-up is completed prior to Functional Performance Tests.

HH. Subs: The subcontractors to the GC who provide and install building components and systems.

II. Test Procedures: The step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CxA.

JJ. Test Requirements: Requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Contract Documents.

KK. Training Plan: A detailed plan prepared by the Contractor and reviewed by the Owner and Commissioning Authority that outlines the training activities, instructors, time durations, and system requirements in accordance with the Contract Documents and Commissioning Plan.

LL. Trending: Data collection of monitoring points using the Building Automation System or data loggers.

MM. Vendor: Supplier of equipment.

NN. Warranty Period: Warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

3. COORDINATION

A. Commissioning Team: The members of the commissioning team consist of the Commissioning authority (CxA), the Owner's Representative (OR), the General Contractor (GC), the architect and design engineers, the Mechanical Contractor (MC), the Electrical Contractor (EC), the Plumbing Contractor (PCtr), the TAB

representative, the Controls Contractor (CC), any other installing subcontractors or suppliers of equipment and the Owner's building operator/engineer for property and operations.

B. Management: The CxA organizes, leads, and coordinates the commissioning activities and the reports to the OR. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

C. Scheduling: The CxA will work with the GC according to established protocols to schedule the commissioning activities. The GC will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

D. The CxA will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. The *Commissioning Plan—Construction Phase* provides a format for this schedule. As construction progresses and more detailed schedules are available from the GC, the CxA will adjust the commissioning schedule accordingly.

4. COMMISSIONING PROCESS

A. Commissioning Plan: The *Commissioning Plan*, provided as part of the bid documents, is binding on the Contractor. The commissioning plan provides guidance in the execution of the commissioning process. Just after the initial commissioning scoping meeting the CxA will update the plan which is then considered the "final" plan, though it will continue to evolve and expand as the project progresses. The *Specifications* will take precedence over the *Commissioning Plan*.

B. Commissioning Process: The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a scoping meeting conducted by the CxA where the commissioning process is reviewed with the commissioning team members.

2. Additional meetings will be required throughout construction, scheduled by the CxA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.

3. Equipment documentation is submitted to the CxA during normal submittal process, including detailed start-up procedures, and installation and operation manuals.

4. The CxA works with the Subs in developing startup plans and startup documentation formats. The Subs are responsible for creating prefunctional checklists and startup documentation based on the manufacturer's recommendations. The CxA will review and approve the documents for use on the project.

5. The CxA reviews the O&M documentation and prefunctional checklists for completeness.

6. The CxA develops specific equipment and system functional performance test procedures.

7. The functional test procedures are reviewed with the OR, A/E, CxA, and Contractors.

8. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with prefunctional checklists being completed before functional testing.

9. The Subs, under their own direction, execute and document the prefunctional checklists and perform startup and initial checkout. The CxA documents that the checklists and startup were completed according to the approved plans. This includes the CxA witnessing start-up of selected equipment.

10. When specified, TAB of air and water with CxA verification of sampled results shall precede trending report and start of functional testing.

11. General Contractor shall coordinate, obtain Acceptance Testing Certificates when required by code and deliver to the CxA for review.

12. General Contractor shall submit REDI-check form acknowledging system readiness for starting functional performance testing of integrated systems. This shall occur after the trending report review and acceptance by owner prior to the start of functional testing.

13. The functional performance testing procedures are executed by the Contractors, under the direction of, and documented by the CxA.

14. Items of non-compliance in material, installation or setup are corrected at the Sub's expense and the system retested.

15. The project will not be considered substantially complete until the conclusion of Commissioning functional performance testing procedures as defined in the commissioning plan.

16. The CxA reviews the training provided by the Contractors and verifies that it was completed.

17. Deferred testing is conducted, as specified or required and shall be approved by OR.

5. COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of the Contractor team, Mechanical, Electrical, Plumbing contractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:

1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.

2. Representatives of the facility user and operation and maintenance personnel.

3. Architect and engineering design professionals.

6. OWNER'S RESPONSIBILITIES

A. Provide the OPR documentation to the CxA and each Contractor for information and use.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

C. Provide the BoD documentation, prepared by Architect and approved by Owner, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

D. Follow the Commissioning Plan.

E. Attend commissioning scoping meetings and additional meetings as necessary.

7. OWNERS REPRESENTATIVE'S RESPONSIBILITIES

A. The Owner's Representative OR shall represent the Owner during the commissioning process as follows:

1. Manage the contract of the A/E, and Contractor.

2. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions according to the *Commissioning Plan – Construction Phase.*

3. Provide final approval for the completion of the commissioning work.

4. Ensure that any seasonal or deferred testing and any deficiency issues are addressed.

5. Follow the Commissioning Plan.

6. Attend commissioning scoping meetings and additional meetings as necessary.

8. ARCHITECT/ENGINEERS(AE) RESPONSIBILITIES

A. The AE shall participate in and perform commissioning process activities including, but not limited to, the following:

1. Attend the commissioning scoping meeting and selected commissioning team meetings.

2. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual preparation, etc., as contracted.

3. Provide any design narrative and sequence documentation requested by the CxA. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

4. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.

5. Prepare and submit final as-built design intent documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.

6. Coordinate resolution of design non-conformance and design deficiencies identified during warranty-period commissioning.

7. Participate in the resolution of non-compliance, non-conformance and design deficiencies identified during commissioning during warranty-period commissioning.

9. CONTRACTOR'S RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.

2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.

3. Attend commissioning team meetings held on a regular basis as determined by the CxA.

4. Integrate and coordinate commissioning process activities with construction schedule.

5. Review and accept construction checklists provided by the installing contractors.

6. Complete electronic construction checklists as Work is completed and provide to the Commissioning Authority.

7. Review and accept commissioning process test procedures provided by the Commissioning Authority.

8. Complete pre-test of functional test procedures and correct deficiencies found during pre-test.

9. Obtain Acceptance Test Certificates when required by code.

10. Complete commissioning process test procedures.

11. Include the cost of commissioning in the total contract price.

12. Coordinate the training of Owner personnel and provide the times and dates of training to the CxA.

13. Execute seasonal or deferred functional performance testing witnessed by the CxA to facilitate the Cx process.

14. Provide a list of final settings, setpoints, ranges, schedules, and / or trend logs required by the CxA.

15. Follow the Commissioning Plan.

16. Attend commissioning scoping meetings and additional meetings as necessary.

17. From the red-line drawings, edit and update one-line diagrams developed as part of the design narrative documentation and those provided by the vendor as shop drawings for the chilled and hot water, condenser water, domestic water; supply, return, outside, and exhaust air systems.

10. SUB CONTRACTOR'S RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Provide all requested submittal data, including detailed start-up procedures, construction checklists and specific responsibilities of the Owner to keep warranties in force.

2. Assist in equipment testing per agreements with Prime.

3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor.

4. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.

5. Review test procedures for equipment installed by factory representatives.

6. Follow the Commissioning Plan.

7. Attend commissioning team meetings held on a monthly basis leading up to bi-weekly meetings once system startup phase begins.

11. CxA'S RESPONSIBILITIES

A. The CxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CxA may assist with problem-

solving non-conformance or deficiencies, but ultimately that responsibility resides with the general contractor and the A/E. The primary role of the CxA is to develop and coordinate the execution of a testing plan, observe and document performance—that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The Contractors will provide all tools or the use of tools to start, check-out and functionally test equipment and systems.

1. Coordinates and directs the commissioning activities using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.

2. Coordinate the commissioning work with the GC and ensure that commissioning activities are being scheduled into the master schedule.

3. Plan and conduct a commissioning scoping meeting and monthly commissioning team meetings on an increased frequency as construction enters into system startup phase.

4. Review and comment on normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.

5. Reviews and gives feedback on the construction checklists prepared by the installing contractor based on manufacturers documentation.

6. Provide Project-specific commissioning process test procedures.

7. Prepare and maintain the Issues Log.

8. Prepare and maintain completed construction checklist log.

9. Witness systems, assemblies, equipment, and component startup.

10. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

11. Revise, as necessary, the Commissioning Plan—Construction Phase.

12. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.

13. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.

14. Develop an enhanced start-up and initial systems checkout plan with Subs.

15. Perform site visits, as necessary, to observe component and system installations. Attends selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.

16. Witness part of the HVAC piping test and flushing procedure, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's representative of any deficiencies in results or procedures.

17. Witness part of any ductwork testing and cleaning procedures, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner’s representative of any deficiencies in results or procedures.

18. Review prefunctional checklists completion and by selected site observation and spot checking to verify completion as well as compliance with manufacturer startup procedures.

19. Verify systems startup completion by reviewing start-up reports and by selected site observation.

20. Review TAB execution plan.

21. Oversee sufficient functional testing of the control system and approve it to be used for TAB, before TAB is executed.

22. Verify air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.

23. With necessary assistance and review from installing contractors, write the functional performance test procedures for equipment and systems. This may include energy management control system trending, stand-alone data logger monitoring or manual functional testing.

24. Review trend reports to verify performance prior to functional performance testing.

25. Coordinate witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.

26. Maintain a master deficiency and resolution log and a separate testing record. Provide the OR and GC with written progress reports and test results with recommended actions.

27. Review equipment warranties to ensure that the Owner's responsibilities are clearly defined.

28. Oversee and review the training of the Owner's operating personnel.

29. Compile and maintain a commissioning record and building systems manual.

30. Review the preparation of the O&M manuals.

31. Provide a final commissioning report.

32. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.

12. SYSTEMS TO BE COMMISSIONED

A. The following checked systems will be commissioned to meet the Owner's goals outlined in the OPR.

Equipment and System	Functional Test Requirements Specified In:	Equipment and System	Functional Test Requirements Specified In:
HVAC Systems		Plumbing Systems	
X VRF Fan Coil Units	23 99 50 thru 23 99 53	X Service Water Heaters	22 08 01
X VRF Heat Recovery Unit	23 99 50 thru 23 99 53	X Circulation Pumps	22 08 01
X VRF Branch Selectors	23 99 50 thru 23 99 53	X Distribution Piping	22 08 01
X Water Source VRF	23 99 50 thru 23 99 53	Electrical Systems	
X Mini-Split Systems Heat Pump	23 99 50 thru 23 99 53	X Sweep or Scheduled lighting Controls	26 99 50 thru 26 99 53

Equipment and System	Functional Test Requirements Specified In:	Equipment and System	Functional Test Requirements Specified In:
X Testing, Adjusting and Balancing work	23 99 50 thru 23 99 53	X Daylight Dimming Controls	26 99 50 thru 26 99 53
X HVAC control systems	23 99 50 thru 23 99 53	X Renewable Energy Systems and Controls	26 99 50 thru 26 99 53

13. REFERENCES

A. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE); 1791 Tullie Circle, NE, Atlanta, GA 30329. Tel: (404) 636-8400. Fax: (404) 321-5478. www.ashrae.org.

1. ASHRAE Guideline 0-2013 - The Commissioning Process.

2. ASHRAE Guideline 1.1-2007 - HVAC&R Technical Requirements For The Commissioning Process.

B. U.S. Green Building Council (USGBC) / Green Building Certification Institute (GBCI); 2101 L Street NW, Washington, DC 20037. Tel: (800) 795-1747. www.usgbc.org.

1. LEED™ Rating System, Version 4 - Green Building Rating System for New Construction, EA Prerequisite: Fundamental Commissioning & EA Credit: Enhanced Commissioning.

2. LEED™ BD&C Reference Guide.

14. TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities. Two-way radios shall be provided by the Division Contractor.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site, except for stand-alone data logging equipment that may be used by the CxA.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5□F and a resolution of + or - 0.1□F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

D. Refer to Section 019113, Part 3.6 E for details regarding equipment that may be required to simulate required test conditions.

15. MEETINGS

A. Scoping Meeting: Within 90 days of building permit receipt, the CxA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the CxA. Information gathered from this meeting will allow the CxA to revise the *Commissioning Plan* to its "final" version, which will also be distributed to all parties.

B. Miscellaneous Meetings: Other meetings will be planned and conducted by the CxA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subs. The CxA will plan these meetings and will minimize unnecessary time being spent by Subs. These meetings may be held monthly, until the final 12 months of construction when they may be held as frequently as bi-weekly.

16. REPORTING

A. The CxA will provide regular site observation and progress reports to the OR, with increasing frequency as construction and commissioning progresses.

B. The CxA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.

C. A final summary report by the CxA will be provided to the OR, focusing on evaluating commissioning process issues and identifying areas where the process could be improved. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc., will be compiled in appendices and provided with the summary report.

17. SUBMITTALS

A. The CxA will provide the appropriate contractors with a specific request for the type of submittal documentation the CxA requires in order to facilitate the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. At minimum, the request will include the manufacturer and model number, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, copies of the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning authority. All documentation requested by the CxA will be included by the Subs in their O&M manual contributions.

1. Requested Submittals:

a. VRF Fan Coil Units

b. VRF Heat Recovery Unit

c. VRF Branch Selectors

d. Exhaust Fans

e. Mini-Split System Heat Pumps

f. Ductwork

g. Duct Insulation

h. Piping systems

i. Testing, Adjusting and Balancing

j. HVAC control systems

k. Lighting Controls

l. Lighting Fixtures

m. Renewable Energy System

n. Service water heater

o. Circulation Pumps

p. Distribution Piping

2. Requested Shop Drawings:

a. Building Distribution Piping

b. Ductwork layout

c. Lighting Control System

3. Requested Product Samples:
a. TBD

18. STARTUP, INITIAL CHECKOUT, AND PRE-FUNCTIONAL CHECKLISTS

A. The following procedures shall apply to all equipment and systems to be commissioned, according to Part 1.13, Systems to Be Commissioned.

1. Pre-Functional Checklists are important to ensure that the equipment and systems are hooked up and operational. These ensure that Systems Functional Performance Testing may proceed without unnecessary delays. Each system to be commissioned shall have a full Pre-Functional Checklist completed by the Contractor prior to Systems Functional Performance Testing. No sampling strategies are used.

a. The Pre-Functional Checklist will identify the trades responsible for completing the checklist. The Contractor shall ensure the appropriate trades complete the checklists.

b. The Commissioning Authority (CxA) will review completed Pre-Functional Checklists and field-verify the accuracy of the completed checklist using sampling techniques.

2. Startup and Initial Checkout Plan: The Contractor shall develop detailed startup plans for all equipment. The primary role of the Contractor in this process is to ensure that there is written documentation that each of the manufacturer recommended procedures have been completed. Parties responsible for startup shall be identified in the Startup Plan and in the checklist forms.

a. The Contractor shall develop the full startup plan by combining (or adding to) the checklists with the manufacturer's detailed startup and checkout procedures from the O&M manual data and the field checkout sheets normally used by the Contractor. The plan shall include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.

b. The full startup plan shall at a minimum consist of the following items:

1) The Pre-Functional Checklists.

2) The manufacturer's standard written startup procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.

3) The manufacturer's normally used field checkout sheets.

3. Sensor and Actuator Calibration

a. All field installed temperature, relative humidity, CO_2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described in Division 22, Division 23, Division 25, and Division 26 specifications.

b. All procedures used shall be fully documented on the Pre-Functional Checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.

4. Execution of Equipment Startup

a. Two (2) months prior to equipment startup, the Contractor shall schedule startup and checkout with the CxA and Facility Operator. The performance of the startup and checkout shall be directed and executed by the Contractor.

b. The CxA will observe the startup procedures for selected pieces of primary equipment.

c. The Contractor shall execute startup and provide the CxA with a signed and dated copy of the completed startup checklists, pre-functional checklist, and contractor tests results.

d. Only individuals that have direct knowledge and witnessed that a line item task on the Startup Checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

19. DEFICIENCIES, NONCONFORMANCE, AND APPROVAL IN CHECKLISTS AND STARTUP

A. The Contractor shall clearly list any outstanding items of the initial startup and Pre-Functional Checklist procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies shall be provided to the CxA within five days of completion.

B. The Commissioning Authority (CxA) will review the report and submit comments to the OR and GC. The CxA will work with the Contractor to verify deficiencies are corrected. The Contractor shall correct all areas that are noncompliant or incomplete in the checklists in a timely manner, and shall notify the CxA as soon as outstanding items have been corrected. The Contractor shall submit an updated startup report and a Statement of Correction on the original noncompliance report. When satisfactorily completed, the CxA will recommend approval of the checklists and startup of each system to the OR.

20. PHASED COMMISSIONING

A. The project may require startup and initial checkout to be executed in phases. This phasing shall be planned and scheduled in a coordination meeting of the OR, GC, CxA, and the sub-contractors. Results will be added to the master construction schedule and the commissioning schedule.

21. SYSTEM FUNCTIONAL PERFORMANCE TESTING

A. This subsection applies to all commissioning functional testing for all divisions.

B. Objectives and Scope: The objective of Systems Functional Performance Testing is to demonstrate that each system is operating according to the Contract Documents. Systems Functional Performance Testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of noncompliant performance are identified and corrected, thereby improving the operation and functioning of the systems. In general, each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load, fire alarm and emergency power) where there is a specified system response. The Contractor shall verify each sequence in the sequences of operation. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.

C. Development of Systems Functional Performance Test Procedures: Before Systems Functional Performance Test procedures are written, the Contractor shall submit all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements found in the Contract Documents and approved submittals and shop drawings, the CxA will develop specific Systems Functional Test Procedures to verify and document proper operation of each piece of equipment and system to be commissioned. The Contractor shall assist the CxA in developing the Systems Functional Performance Test procedures as requested by the CxA i.e. by answering questions about equipment, operation, sequences, etc. Prior to execution, the CxA will provide a copy of the Systems Functional Performance Test procedures to the OR, the Architect/Engineer, and the Contractor, who shall review the tests for feasibility, safety, equipment and warranty protection.

D. Purpose of Test Procedures: The purpose of each specific Systems Functional Performance Test is to verify and document compliance with the stated criteria of acceptance given on the test form. Representative test formats and examples are found in the Commissioning Plan for this project. (The Commissioning Plan is issued as a separate document and is available for review.) The test procedure forms developed by the Commissioning Agent will include, but not be limited to, the following information:

1. System and equipment or component name(s)
2. Equipment location and ID number
3. Unique test ID number and reference to unique Pre-Functional Checklists and startup documentation, and ID numbers for the piece of equipment.
4. Date
5. Project name
6. Participating parties
7. A copy of the specification section describing the test requirements
8. A copy of the specific sequence of operations or other specified parameters being verified
9. Formulas used in any calculations
10. Required pretest field measurements
11. Instructions for setting up the test.
12. Special cautions, alarm limits, etc.
13. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format.
14. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
15. A section for comments.

16. Signatures and date block for the Commissioning Agent.

17. A place for the Contractor to initial to signify attendance at the test.

E. Test Methods: Systems Functional Performance Testing shall be achieved by manual testing (i.e. persons manipulate the equipment and observe performance) and/or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by standalone data loggers. The Contractor and Commissioning Agent shall determine which method is most appropriate for tests that do not have a method specified.

1. Simulated Conditions: Simulating conditions (not by an overwritten value) shall be allowed, although timing the testing to experience actual conditions is encouraged wherever practical.

2. Overwritten Values: Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.

3. Simulated Signals: Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.

4. Altering Setpoints: Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the Air Conditioning compressor lockout initiate at an outside air temperature below 12 C (54 F), when the outside air temperature is above 12 C (54 F), temporarily change the lockout setpoint to be 2 C (4 F) above the current outside air temperature.

5. Indirect Indicators: Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification shall be completed during systems startup and initial checkout.

F. Setup: Each function and test shall be performed under conditions that simulate actual conditions as closely as is practically possible. The Contractor shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Contractor shall return all affected building equipment and systems, due to these temporary modifications, to their pretest condition.

G. Sampling: No sampling is allowed in completing Pre-Functional Checklists. Sampling is allowed for Systems Functional Performance Test Procedures execution and are listed below. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CxA may stop the testing and require the Contractor to perform and document a checkout of the remaining units, prior to continuing with Systems Functional Performance Testing of the remaining units.

1. Use of ASHRAE sampling techniques during functional testing are acceptable only for similar HVAC and plumbing DHW units. Provide CxA witnessing for 10% of residential units and 15% for common area HVAC units. Lighting controls Cx functional test witnessing can be limited to 30% of similar residential floors and office floors. Other major systems not listed above are expected to be 100% CxA witnessing and verification of functional performance testing with Contractor.

H. Coordination and Scheduling: The Contractor shall provide a minimum of 7 days notice to the Commissioning Agent and the OR regarding the completion schedule for the Pre-Functional Checklists and startup of all equipment and systems. The Commissioning Agent will schedule Systems Functional Performance Tests with the Contractor and OR. The Commissioning Agent will witness and document the Systems Functional

Performance Testing of systems. The Contractor shall execute the tests in accordance with the Systems Functional Performance Test Procedure.

I. Testing Prerequisites: In general, Systems Functional Performance Testing will be conducted only after Pre-Functional Checklists have been satisfactorily completed and Acceptance Test Certificates are delivered to the CxA when applicable. The control system shall be sufficiently tested and approved by the Commissioning Agent and the OR before it is used to verify performance of other components or systems. The air balancing and water balancing shall be completed before Systems Functional Performance Testing of air-related or water-related equipment or systems are scheduled. Systems Functional Performance Testing will proceed from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems will be checked.

J. Problem Solving: The Commissioning Agent will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the Contractor.

22. DOCUMENTATION, NONCONFORMANCE AND APPROVAL OF TESTS

A. Documentation: The Commissioning Agent will witness, and document the results of all Systems Functional Performance Tests using the specific procedural forms developed by the Commissioning Agent for that purpose. Prior to testing, the Commissioning Agent will provide these forms to the VA and the Contractor for review and approval. The Contractor shall include the filled out forms with the O&M manual data.

B. Nonconformance: The Commissioning Agent will record the results of the Systems Functional Performance Tests on the procedure or test form. All items of nonconformance issues will be noted and reported on the Commissioning Master Issues Log.

1. Corrections of minor items of noncompliance identified may be made during the tests. In such cases, the item of noncompliance and resolution shall be documented on the Systems Functional Test Procedure.

C. Cost of Retesting: The cost to retest a System Functional Performance Test shall be solely the responsibility of the Contractor. Any required retesting by the Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.

D. Approval: The Commissioning Agent will note each satisfactorily demonstrated function on the test form. Formal approval of the Systems Functional Performance Test shall be made later after review by the Commissioning Agent and by the OR. The Commissioning Agent will evaluate each test and report to the OR using a standard form. The OR will give final approval on each test using the same form, and provide signed copies to the Commissioning Agent and the Contractor.

23. TRAINING OF OWNER PERSONNEL

A. The Contractor shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed.

B. The CxA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.

1. The CxA shall interview the facility manager and lead engineer to determine the special needs and areas where training will be most valuable. The Owner and CxA shall decide how rigorous the training should be for each piece of commissioned equipment. The CxA shall communicate the results to the Subs and vendors who have training responsibilities. In addition to these general requirements, the specific training requirements of Owner personnel by Subs and vendors is specified in Division 22, 23, and 26.

2. Each Sub and vendor responsible for training will submit a written training plan to the CxA for review and approval prior to training. The plan will cover the following elements:

a. Equipment (included in training)

b. Intended audience

c. Location of training

d. Objectives

e. Subjects covered (description, duration of discussion, special methods, etc.)

f. Duration of training on each subject

g. Instructor for each subject

h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)

i. Instructor and qualifications

j. For the primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.

3. The GC and CM develop an overall training plan and coordinates and schedules the overall training for the commissioned systems. The CxA develops criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The CxA recommends approval of the training to the CM using a standard form. The CM also signs the approval form at one of the training sessions, at the request of the owner, the CxA presents a one hour presentation discussing the use of the blank functional test forms for re-commissioning equipment. Video recording of the training sessions will be provided by the Trade Contractor with media cataloged by the CxA and added to the O&M manuals.

24. OPERATION AND MAINTENANCE MANUALS

A. Standard O&M Manuals.

1. The specific content and format requirements for the standard O&M manuals are detailed in Section 017823.

25. WRITTEN WORK PRODUCTS

A. The commissioning process generates a number of written work products described in various parts of the Specifications. The Commissioning Plan—Construction Phase, lists all the formal written work products, describes briefly their contents, who is responsible to create them, their due dates, who receives and approves them and the location of the specification to create them. In summary, the written products are:

B.

Product		Developed By
1.	Final commissioning plan	CxA
2.	Cx meeting minutes	CxA
3.	Commissioning schedules	CxA with GC
4.	Equipment documentation submittals	Subs
5.	Sequence clarifications	Subs and A/E as needed

5.	Prefunctional checklists	Subs
6.	Acceptance Test Certificates	GC with ATT
7.	Startup and initial checkout plan	Subs and CxA (compilation of existing documents)
8.	Startup and initial checkout forms filled out	Subs
9.	Final TAB report	TAB
10.	Trending FPT Pre-test Report (14 days)	Subs with CC
11.	Issues log (deficiencies)	CxA
12.	Commissioning Progress Record	CxA
13.	Deficiency reports	CxA
14.	Functional test forms	CxA
15.	Filled out functional tests	CxA
16.	O&M manuals	Subs
17.	System Manual	CxA
18.	Overall training plan	CxA and OR and GC
19.	Specific training agendas	Subs
20.	Final commissioning report	CxA
21.	Post Occupancy Building Operations Report	CxA

END OF SECTION

SECTION 02 41 16

BUILDING DEMOLITION

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Demolition of designated buildings and structures.

B. Demolition of foundations and slabs-on-grade.

C. Demolition of site improvements.

D. Demolition of concrete and asphalt paving.

E. Removal of materials from site.

F. Recycling and salvaging of materials.

G. Disconnecting and capping removal of identified utilities.

H. Removal of Abandoning in place underground piping.

I. Temporary fire protection.

J. Schedule of materials and equipment.

1.2 DEFINITIONS

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

B. Disposal: Removal off-site of demolition waste and subsequently deposit in landfill acceptable to authorities having jurisdiction.

C. Salvage: Recovery of demolition waste for subsequent reuse.

D. Recycle: Recovery of demolition waste for subsequent processing.

E. Existing to Remain: Items of construction that are not to be removed and that are not indicated to be removed salvaged, or recycled.

1.3 MATERIALS OWNERSHIP

A. Historic items, relics, cornerstones, commemorative plaques, tablets and similar objects encountered during demolition are to remain the Owner’s property.

B. Carefully remove each item in a manner to prevent damage and deliver to Owner.

1.4 SUBMITTALS

A. Predemolition Photographs: Show conditions of exiting adjacent construction and site improvements that might be misconstrued as damaged by demolition operations. Submit before work begins.

B. Record Documents: Submit under provisions of Section 01 77 00. Accurately record locations of utilities and subsurface obstructions.

C. Landfill Records: Receipt and acceptance of hazardous waste by a landfill licensed to accept hazardous waste.

1.5 QUALITY ASSURANCE

A. Demolition Firm: Experienced firm that specializes in demolition work similar to extent indicated for this project.

1.6 PROJECT CONDITIONS

A. Buildings to be demolished will be evacuated and their use discontinued before start of work.

B. Owner will occupy building(s) adjacent to demolition area. Conduct demolition so owner's operation will not be disrupted.

C. Provide at least 72 hour notice to Owner of activities that will affect Owner's operation.

D. Maintain access to existing walkways, exits and other adjacent occupied facilities.

E. Owner assumes no responsibility for buildings and structures to be demolished.

F. Hazardous Materials: Hazardous materials are present in buildings to be demolished. A report on the presence of hazardous materials is on file for review and use.

1. Hazardous materials remediation is specified in Section 02 80 00 – Facility Remediation.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for demolition of structures, safety of adjacent structures, dust control and disposal of materials.

B. Comply with California Fire Code (CFC), California Code of Regulations, (CCR) Title 24, Part 9, Chapter 5 - Fire Service Features and Chapter 33 - Fire Safety During Construction and Demolition.

C. Obtain required permits from authorities.

D. Notify affected utility companies before starting work and comply with their requirements.

E. Do not close or obstruct roadways, sidewalks, and hydrants without permits.

1.8 SCHEDULING

A. Schedule work under the provisions of Section 01 32 00.

B. Schedule Work to coincide with new construction and owner occupancy.

C. Perform work during normal hours of operation.

D. Notify Owner in writing 5 days in advance of any required work to be performed on a weekend or holiday.

2. PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Subsoil Fill Material: Type of fill as specified in Section 31 20 00.

B. Recycled Demolition Waste: Crushed masonry, concrete paving, concrete as specified in Section 01 74 19.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Correlate existing conditions with requirements indicated.

B. Inventory and record condition of items to be removed and salvaged.

C. Execute predemolition photographs.

D. Verify that hazardous waste remediation is complete.

3.2 PREPARATION

A. Existing Utilities: Locate, identify, disconnect and seal or cap off indicated utilities serving buildings to be demolished.

B. Salvaged Items: Clean, pack and identify items for storage and delivery to Owner.

C. Provide, erect, and maintain temporary barriers and security devices under provisions of Section 01 50 00.

D. Protect existing landscaping materials, appurtenances, and structures which are not to be demolished.

E. Prevent movement or settlement of adjacent structures. Provide bracing and shoring.

3.3 DEMOLITION REQUIREMENTS

A. Demolish indicated buildings and structures and site improvements completely.

B. Conduct demolition to minimize interference with adjacent structures and occupancies.

C. Cease operations immediately if adjacent structures appear to be in danger. Notify Architect. Do not resume operations until directed.

D. Conduct operations with minimum interference to public accesses. Maintain egress and access at all times.

E. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon or limit access to their property.

F. Sprinkle Work with water to minimize dust. Provide hoses and water connections for this purpose.

G. Maintain fire safety during demolition in accordance with CFC, Chapter 33.

3.4 DEMOLITION

A. Remove structural framing systematically, from higher to lower level. Complete each floor or tier before disturbing next adjacent level.

B. Remove debris from elevated portions by chute, hoist or other device that will convey debris to grade level in a controlled descent.

C. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust.

D. Foundation Walls and Footings: Demolish and remove for depth of structure.

E. Concrete Floor Slabs-on-Grade: Saw-cut at perimeter of area to be demolished then break up and remove.

F. Concrete and Asphalt Paving: Saw-cut at perimeter of area to be demolished then break up and remove.

G. Existing Utilities: Abandon existing below grade utilities. Cut utilities to depths indicated.

G. Existing Utilities: Demolish and remove existing below grade utilities.

H. Remove materials to be re-installed or retained in manner to prevent damage. Store and protect in accordance with requirements of Section 01 61 00.

I. Backfill open pits and holes caused as a result of demolition, with in accordance with Section 31 20 00.

J. Uniformly rough grade and compact areas affected by demolition to maintain site grades and contours.

K. Remove temporary work.

3.5 RECYCLING OF DEMOLITION MATERIALS

A. Recycle demolition waste under the provisions of Section 01 74 19.

A. Separate recycled demolition materials from other demolished materials.

B. Stockpile processed materials on-site without intermixing with other materials.

C. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

D. Do not store materials with in drip line of trees.

E. Transport recyclable materials that are not indicated to be reused off Owner’s property to recycling receiver or processor.

F. Recycled incentives received for building demolition materials shall be equally shared between Contractor and Owner.

G. Concrete: Crush concrete and screen to comply with requirements in Division 31 and Division 32.

H. Concrete: Break up and transport to concrete-recycling facility.

I. Concrete Reinforcement: Remove reinforcement from concrete and sort with other metals.

J. Masonry: Crush masonry and screen to comply with requirements in Division 31 - Section 31 20 00 - Earth Moving for use as satisfactory soil for fill or subbase.

K. Masonry Reinforcement: Remove reinforcement from masonry and sort with other metals.

L. Wood Materials: Sort and stack members according to size, type and length. Separate dimensional and engineered lumber, panel products, and treated wood materials.

M. Metals: Separate by metal type. Remove nuts, bolts and rough hardware. Sort structural steel by type and size.

N. Roofing: Separate organic and fiberglass shingles and felts. Remove nails, staples and accessories.

O. Doors and Hardware: Brace open end of door frames. Leave hardware attached to doors.

P. Carpet and Pad: Store clean dry carpet and pad in a closed container or trailer.

Q. Gypsum Board: Stack large clean pieces on pallets. Remove edge trim and sort with metals. Remove and dispose of fasteners.

R. Acoustical Ceiling Materials: Stack panels and tiles on pallets. Separate suspension system and sort with metals.

S. Equipment: Drain tanks, piping and fixtures. Seal openings with caps or plugs.

T. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves and other components.

U. Lighting Fixtures: Remove lamps and separate by type.

V. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

W. Conduit: Reduce conduit to straight lengths and store by type and size.

3.6 SALVAGING OF DEMOLITION MATERIALS

A. Salvage materials under the provisions of Section 01 74 19.

A. Clean salvaged items.

B. Pack or crate items after cleaning. Identify contents.

C. Store items in secure area until delivery to Owner.

D. Protect items from damage.

E. Install salvaged items to comply with requirements for new materials and equipment.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Except for items to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain, remove demolished materials from Project site and legally dispose of them in an EPA – approved landfill.

B. Do not burn or bury materials on site.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt and debris caused by demolition.

B. Return adjacent areas to condition existing before demolition operations began.

C. Leave site in a clean condition.

END OF SECTION

DOCUMENT 02 80 00

HAZARDOUS MATERIAL REMEDIATION

1. SUMMARY

   A. This document describes the hazardous material remediation required for construction and the pre-demolition survey conducted in the building and the use of data from the survey report.

2. ASBESTOS SURVEY

   A. A Hazardous Material Report, titled "Pre-Demolition Asbestos, Lead, and Miscellaneous Toxic Materials (Universal Wastes) Survey Report, Fire Station #2 at 800 Baker Street, Costa Mesa, CA", dated October 15, 2024, has been prepared for the building of the Work by Masek Consulting Services, Inc., selected by the Owner.

   B. A copy of the Hazardous Material Report has been included in the Appendix1 of the specification.

3. USE OF DATA

   A. Hazardous Material Report was obtained by the Owner only for use in remediation and is a part of the Contract Documents.

   B. The report is made available for bidders' information only and is not a warranty of existing conditions.

4. QUALITY ASSURANCE

   A. A Consulting or Testing Agent will be retained by the Owner to observe performance of work in connection with the inspection of the Hazardous Material Remediation.

5. GENERAL PROVISIONS

   5.1 Contractor shall be responsible for compliance with **ALL** applicable laws and regulations, including, but not limited to:

      A) The US EPA Asbestos NESHAP (40 CFR Part 61 Subpart M) and South Coast Air Quality Management Rules 1403 and 222;

      B) Federal Occupational Health and Safety Administration laws and regulations, such as those in 29CFR1926.1101;

      C) Titles 8 and 17 of the California Code of Regulations; and,

      D) Letters from the federal Occupational Safety and Health Administration interpreting their regulations which make it clear that materials containing less than 1% asbestos are still covered by significant portions of their asbestos regulations and that employers must exercise due diligence to avoid violations and exposures to asbestos.

      E) The South Coast Air Quality Management District’s requirement that a containment with poly sheeting on the walls and a ceiling be installed in all regulated areas in which buffers will be used to remove floor tile mastic.

   5.2 It is not the intent of these specifications to add burdensome requirements, but the requirements of these specifications, not any lesser requirements of any particular regulation, shall apply to the work.

   5.3 The Hazardous Material Report is included herein by reference.

   5.4 Contractor shall carefully inspect the work site and the documents provided and determine to their satisfaction the quantities and locations of materials to be removed and the conditions which will impact the work prior to submitting their bid.

5.5 For clarity, the phrase “in compliance with all applicable laws and regulations” is not repeated through out these specifications, and Contractor shall not treat the absence of that phrase as an indication that non-compliant removal or disposal are permissible.

5.6 Contractor shall immediately notify the Consulting Agent (individual(s) hired by the Contractor to serve as abatement remediation personnel) of any issues which might delay or slow the work, and shall have procedures and plans in place to keep the work going in the event of events such as, but not limited to, equipment breakdowns or supervisor illness.

5.7 Contractor shall provide asbestos abatement supervisors who have at least five years prior abatement experience, and shall provide copies or originals of their latest refresher training certificate, as well as an outline / summary of their experience listing specific projects.

5.8 Contractor shall cooperate with the Consulting Agent in not allowing any Contractor personnel without copies of training (initial or refresher), medical exam, and fit test documents less than one year old to perform abatement work. Contractor may only allow personnel without such documents to perform tasks outside of critical barriers which do not require training, such as organizing supplies and picking up and delivering equipment.

5.9 Contractor shall provide all abatement personnel and consultant personnel with good quality Tyvek (not spun polyester) type coveralls in a range of sizes up to 5X, and shall only allow abatement personnel to wear nylon swim suits under the coveralls (they may wear boots and other protective clothing over the coveralls, but only if those items are stored in sealed 6-mil plastic bags when taken in and out of containments. Contractor shall provide all personnel requiring additional protection with additional protective clothing / equipment (e.g. nylon leg covers or boots) to wear over their coveralls.

5.10 Contractor shall see that the workers properly decontaminate using the shower when exiting the containment.

5.11 Contractor shall not sample nor analyze, nor cause to be sampled and analyzed, any bulk samples of materials for asbestos, nor perform any testing of paint or ceramic tile for lead. In the unlikely event that a significant quantity of a previously hidden and previously un-tested material is encountered, the Consulting Agent will sample it.

5.12 Contractor shall not haul any wastes (asbestos, fluorescent tubes, fluorescent ballasts) before the Consulting Agent reviews and approves each and every waste transportation manifest, and shall provide copies of every such manifest for the Owner to be placed into their report.

5.13 Contractor shall require that all of their employees who enter the job site sign a form at the end of each work shift indicating that they either had no accidents or injuries, or detailing any accidents or injuries, and that copies of those forms shall be provided to the Consulting Agent at the end of each work shift (carbon copy or carbonless copy forms are recommended). Employees who fail to complete such a form will not be permitted to reenter the job site prior to completing the form for the prior shift.

5.14 Contractor shall use a three stage decontamination unit (with a working ***hot and cold*** water shower, pump and filter assembly, adequate soap, and adequate towels) for all asbestos and lead abatement work.

5.15 In addition to the postings at the job site required by the laws and regulations, Contractor shall also post copies of their contractor’s license and insurance certificate.

5.16 Contractor shall utilize GFCI-protected outlets for connection of any and all of their lights and other single phase electrical equipment and to provide adequate provisions for connection of air monitoring pumps and other consulting equipment.

5.17 Contractor shall perform the personal air monitoring of the contractor's employees. Contractor shall submit all personal air monitoring to the analytical laboratory chosen by Contractor for “same day received” analysis by the PCM method, and shall post at the job site the results of each laboratory analysis, not more than two work days following the day the samples were collected.

5.18 The Consulting Agent will visually inspect each work area prior to the start of any actual asbestos and/or lead removal and Contractor shall not start work until given clearance to proceed by that Consultant.

5.19 The Consulting Agent will inspect (visually and/or with air / wipe sample clearance testing) each work area after the completion of the asbestos and/or lead removal and Contractor shall not be finished with the work in any area until given clearance by that Consultant. Clearance shall be issued verbally by the Consultant, followed with a written clearance sent by E-mail or FAX.

5.20 Contractor personnel shall promptly obey the project-related directives of The Consulting Agent for anything other than gross violations of applicable laws and regulations, written first warnings will be issued. There shall be no second warnings. Contractor shall remove and promptly replace all personnel who do not promptly obey the project-related directives of the Consulting Agent.

5.21 The Consulting Agent shall have the right to refuse to allow Contractor to use or continue to use any equipment which the Consulting Agent feels is malfunctioning or in poor and/or unsafe condition. However, Contractor shall not rely upon the Consulting Agent to identify such equipment, and shall retain all responsibility for any illness or injury to their workers due to equipment and/or tools which is malfunctioning, unsafe, or in poor condition.

5.22 Contractor shall only use amended water, not plain water from garden hoses, to wet materials.

5.23 Contractor shall see that workers / supervisors in coveralls and respirators are not be visible from outside of regulated areas, and will construct view screens (e.g. black or opaque poly) as needed.

6. MATERIALS WHICH CONTAIN ASBESTOS

6.1 Contractor shall remove and dispose of all of the materials which contain asbestos as listed in the Hazardous Material Report.

6.2 Contractor shall cooperate with the Consulting Agent in the performance of air monitoring by the Consulting Agent. This includes providing adequate power for air sampling equipment and adequate light.

6.3 Contractor shall use bags or other disposal containers appropriate for the waste and debris placed into them. If normal asbestos waste bags are used, double bags must be utilized. Double wrapping in poly of long or odd shaped items shall be acceptable. Dumpster liners / bags, double-lined cubic yard boxes, and double-lined drums may be used.

6.4 For solvent removal of mastic on concrete, contractor shall only use soy-based mastic removal solvent, such as: Bean-e-doo ® from Franmar (not for use to remove mastic from wood) at http://www.franmar.com/ and local suppliers such as Inline Distributing Company http://inlineco.com.; No Bee-300 (not for use to remove mastic from wood) from American Coatings Corporation at 3037 N.W. 60th St. Ft. Lauderdale FL, 33309, Tel: 800-533-0151 / Fax: 954-970-3690 and local suppliers such as J&L Environmental Supplies, Inc., 1500 S. Eastern Ave., City of Commerce, CA 90040, Phone 323-262-5459, FAX 323-262-1663; or, Sentinel 909.

6.5 Contractor shall use a buffer or hand tools and scrub pads to work the solvent into the mastic, consistent with the mastic removal solvent manufacturer's recommendations / requirements, and scrub pads and scrapers to perform detailed cleaning of edges and other such areas. Once the mastic removal is completed, Contractor shall wash the floor using a good quality commercial cleaning solution which does not leave a residue and clean rags and scrub pads, finishing by wiping the floor with clean water and clean rags.

7. FLUORESCENT AND HID LAMPS/BULBS AND BALLASTS

7.1 Contractor shall carefully remove, pack and ship/transport to a recycling company all fluorescent lamp tubes in fixtures which are to be removed.

7.2 Contractor shall assume that all lamp ballasts / HID ballasts contain PCBs, except those found to be marked / date coded as not containing PCBs, and that ballasts shall be removed and packed for recycling and disposed by transportation to an approved company (***not land fill disposal***).

7. REFRIGERANTS

8.1 Contractor shall remove and dispose all refrigerants from the refrigerators if they are to be demolished, unless the units are donated or picked-up by a refrigerator recycling organization. The technician(s) performing the refrigerant recovery must be trained and certified under Section 608 of the Clean Air Act, 40CFR Part 82, with copies of their certification documents on site for review by Masek Consulting Services, Inc.

END OF DOCUMENT

SECTION 03 11 00

CONCRETE FORMWORK

1. PART 1 GENERAL

1.1 SECTION INCLUDES

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

B. Openings for other affected work.

C. Form accessories.

D. Stripping forms.

1.2 REFERENCES

A. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Chapter 19.

B. ACI 301 - Specifications for Structural Concrete.

C. PS 1-09 - Structural Plywood.

1.3 SYSTEM DESCRIPTION

A. Design, engineer, and construct formwork, shoring, and bracing to meet design and code requirements, so that resultant concrete conforms to required shapes, lines, and dimensions.

1.4 QUALITY ASSURANCE

A. Construct and erect concrete formwork in accordance with ACI 301.

1.5 REGULATORY REQUIREMENTS

A. Conform to CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

2. PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Plywood: PS1-09, BB Plyform grade, Class I, Exterior classification.

B. Lumber: Douglas Fir species; construction grade; with grade stamp clearly visible.

C. Tubular Column: Round, smooth, fiber reinforced tube with plastic coated paper lining, of sizes required.

2.2 FORMWORK ACCESSORIES

A. Form Ties: Snap-off metal of adjustable length; cone type; 1 inch break back dimension; free of defects that will leave holes no larger than one inch diameter in concrete surface.

B. Form Release Agent: Colorless material which will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.

C. Fillets for Chamfered Corners: Wood strips type; 3/4 x 3/4 inch size; maximum possible lengths.

D. Dovetail Anchor Slots: Minimum 22 gage galvanized steel; foam filled; release tape sealed slots; bent tab anchors; securable to concrete formwork; manufactured by Heckmann Building Products Co., www.heckmannbuildingprods.com.

E. Flashing Reglets: 26 gage thick galvanized steel; longest possible lengths; release tape sealed slots; with alignment splines for joints; securable to concrete formwork; Type CO reglet manufactured by Fry Reglet www.fryreglet.com.

F. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required; of strength and character to maintain formwork in place while placing concrete.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify lines, levels, and measurements before proceeding with formwork.

3.2 PREPARATION

A. Obtain Architect's approval for use of earth forms for footings.

B. Minimize form joints. Symmetrically align joints and make watertight to prevent leakage of mortar.

C. Arrange and assemble formwork to permit stripping, so that concrete is not damaged during its removal.

D. Arrange forms to allow stripping without removal of principal shores, where required to remain in place.

3.3 ERECTION

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be overstressed by construction loads.

C. Provide chamfer strips on external corners of walls.

D. Obtain approval before framing openings in structural members which are not indicated on Drawings.

E. Do not displace or damage vapor barrier placed by Section 03 30 00.

F. Construct formwork to maintain tolerances in accordance with ACI 301.

3.4 APPLICATION OF FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.

B. Do not apply form release agent where concrete surfaces are scheduled to receive applied coverings which may be affected by agent. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for work embedded in or passing through concrete.

B. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

C. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.

3.6 FORM REMOVAL

A. Do not remove forms and bracing until concrete has sufficient strength to support its own weight and imposed loads.

B. Reshore structural members due to design requirements or construction conditions to permit successive construction.

C. Remove formwork progressively so no unbalanced loads are imposed on structure.

D. Do not damage concrete surfaces during form removal.

E. Store reusable forms for exposed architectural concrete to prevent damage to contact surfaces.

F. Remove formwork in same sequence as concrete placement to achieve similar concrete surface coloration.

3.7 CLEANING

A. Clean forms to remove foreign matter as erection proceeds.

B. Ensure that water and debris drain to exterior through clean-out ports.

3.8 EARTH FORMS

A. Construct wood edge strips at top sides of excavations as indicated on drawings.

B. Provide forms for footings and foundation walls wherever concrete cannot be placed against solid earth.

C. Remove loose dirt and debris from form area prior to concrete placement.

D. Concrete for foundations may be placed directly into neat excavations provided the foundation trench walls are stable as determined by the Architect (Structural Engineer).

E. When earth formed foundations are used, the minimum formwork shown on the drawings is mandatory to insure clean excavations prior to and during concrete placement.

F. Provide 3-1/2 inch high starter wall for all concrete and masonry walls below grade.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Reinforcing steel bars, welded steel wire fabric, for fabricated steel bar or rod mats for cast-in-place concrete.

B. Support chairs, bolsters, bar supports, and spacers, for supporting reinforcement.

1.2 REFERENCES

A. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Chapter 19 (ACI 318).

B. ACI 301 - Specifications for Structural Concrete.

C. C. ACI 315 (SP-66) - Details and Detailing of Concrete Reinforcement.

D. ACI 318 - Building Code Requirements for Structural Concrete.

E. ASTM A615 - Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

F. ASTM A706 - Standard Specification for Low Alloy Steel Deformed Bars for Concrete Reinforcement.

G. ASTM A1064 - Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

H. ASTM C1116 - Specification for Fiber-Reinforced Concrete and Shotcrete.

I. AWS D1.4 - Structural Welding Code Reinforcing Steel.

J. CRSI - Manual of Practice.

K. CRSI - Placing Reinforcing Bars.

1.3 QUALITY ASSURANCE

A. Perform concrete reinforcement work in accordance with CRSI Manual of Standard Practice.

B. Conform to ACI 301 and ACI 315 (SP-66).

C. Conform to CBC California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00: Submittal Procedures.

B. Shop Drawings:

1. Comply with requirements of ACI MNL-66. 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 mill test certificates of supplied concrete reinforcing, indicating physical and chemical analysis.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit data for content of post-consumer and pre-consumer recycled content under provisions of Section 01 81 13.

2. PART 2 PRODUCTS

2.1 MATERIALS

A. Provide reinforcing steel with a minimum post-consumer recycled content of 75 percent.

B. Reinforcing Steel: ASTM A615, Grade 40 for No. 4 bars and smaller, Grade 60 for No. 5 bars and larger. Billet-steel deformed bars, uncoated finish.

C. Welded Reinforcement: ASTM A706, Grade 60, deformed bars, unfinished.

D. Welded Steel Wire Fabric: ASTM A1064 plain type; coiled rolls; uncoated finish.

E. Steel Wire: ASTM A1064, plain, cold drawn steel.

2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage annealed type.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete including load bearing pad on bottom to prevent vapor barrier puncture.

C. Chairs, Bolsters, Bar Supports, Spacers Adjacent to Architectural Concrete Surfaces: Plastic coated sized and shaped as required.

2.3 FABRICATION

A. Fabricate in accordance with ACI 315 (SP-66), providing concrete cover specified in Section 03 30 00.

B. Locate reinforcing splices not indicated on Drawings at points of minimum stress.

C. Weld reinforcing bars in accordance with AWS D1.4.

3. PART 3 EXECUTION

3.1 INSTALLATION

A. Before placing concrete, clean reinforcement of foreign particles or coatings.

B. Place, support, and secure reinforcement against displacement. Do not deviate from alignment or measurement.

C. Mix fibrous reinforcement into concrete material according to Section 03 30 00.

D. Do not displace or damage vapor barrier required by Section 03 30 00.

3.2 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 29.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cast-in-place concrete foundation walls, and footings.

B. Floors and slabs on vapor barrier.

C. Control, expansion, and contraction joint devices associated with concrete work.

D. Curing and sealing compound.

E. Utility slabs.

F. Equipment pads, Thrust blocks.

1.2 REFERENCES

A. The 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design.

B. CBC - California Building Code, (CCR) California Code of Regulations Title 24, Part 2, Chapter 19.

C. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

D. ACI 301 - Specifications for Structural Concrete.

E. ACI 302.1R - Guide for Concrete Floor and Slab Construction.

F. ACI 305.1 - Specification for Hot Weather Concreting.

G. ACI 306.1 - Standard Specification for Cold Weather Concreting.

H. ACI 318 - Building Code Requirements for Structural Concrete.

I. ASTM C33 - Concrete Aggregates.

J. ASTM C94 - Ready-Mixed Concrete.

K. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.

L. ASTM C150 - Portland Cement.

M. ASTM C289 - Potential Reactivity of Aggregate.

N. ASTM C309 - Liquid Membrane Forming Compound.

O. ASTM C330 - Lightweight Aggregates for Structural Concrete.

P. ASTM C494 - Standard Specifications for Chemical Admixtures for Concrete.

Q. ASTM C567 - Standard Test Method for Determining Density of Structural Lightweight Concrete.

R. ASTM C618- Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

S. ASTM C932 - Surface-Applied Bonding Agents.

T. ASTM C1315 - Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

U. ATM C1602 - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.

V. ASTM D226 - Asphalt Saturated Organic Felt used in Roofing and Waterproofing.

W. ASTM D1751 - Preformed Expansion Joint Filler for Concrete Paving and Structural Construction.

X. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.

Y. ASTM E154 - Standard Test Methods for Water Vapor Retardants used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

Z. ASTM E1643 - Installation of Water Vapor Retarders used in Contact with Earth or Granular Fill Under Concrete Slab.

AA. ASTM E1155 - Determining Floor Flatness and Levelness Using the F-Number System.

BB. ASTM E1745 - Standard Specifications for Plastic Water Vapor Retarders Used in Contact with Soil Or Granular Fill Under Concrete Slabs.

CC. ASTM F1249 - Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

DD. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

EE. National Ready Mix Concrete Association - Plant Certification Program.

FF. Stormwater Best Management Practice Handbook (BMP Handbook), Construction Edition, as published by the California Storm Water Quality Association.

1.3 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Installation of vapor barrier shall be in accordance with ASTM E1643 and manufacturer’s installation guides and recommendations. Provide Architect written site reports from manufacturer’s field service representative, indicating observation of vapor barrier installation prior to concrete placement.

C. Obtain concrete materials from same source throughout the Work.

1.4 QUALIFICATIONS

A. Manufacturer: Manufacturer of ready-mix concrete products complying with ASTM C94 requirements for production facilities and equipment. Certified according to National Ready Mix Concrete Associates Plant Certification Program.

1.5 DESIGN MIX

A. Submit design mix for each class of concrete, prepared by a California Registered Civil Engineer, to Testing Laboratory and Architect for review.

1.6 REGULATORY REQUIREMENTS

A. Conform to CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

B. Conform to CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, and the 2010 ADA Standards for Accessible Design for access requirements for individuals with disabilities.

1.7 SUBMITTALS

A. Submit product data and manufacturer's instructions for all accessories under provisions of Section 01 33 00.

1.8 FIELD SAMPLE

A. Provide field sample of each type of finish under provisions of Section 01 43 00.

B. Provide a minimum 3'-0" x 3'-0" sample panel to be reviewed by Architect.

C. Accepted sample may remain as part of work.

D. Field sample will demonstrate minimum standard for the work.

1.9 PRE-INSTALLATION CONFERENCE

A. Convene a conference two weeks prior to commencing placement of floor slab work of this section, under provisions of Section 01 31 00.

B. Require attendance of parties directly affecting the work of this Section including vapor barrier manufacturer’s representative.

C. Agenda:

1. Placement of subgrade beneath floor slab.

2. Testing of subgrade beneath floor slab.

3. Delivery and placement of concrete.

4. Testing and inspection procedures for concrete.

5. Submittal of mix design for concrete.

6. Hot and cold weather concreting procedures.

7. Vapor barrier location and installation.

8. Placement of control and expansion joints.

9. Steel reinforcement installation.

10. Installation of inserts and embedded items.

11. Finishes and finishing.

12. Forming and form removal limitations.

13. Floor slab flatness and levelness requirements.

14. Curing process and procedures.

15. Protection of finished floor slabs.

16. Floor slab joint and crack repair.

17. Moisture vapor transmission testing.

1.10 WARRANTY

A. Provide fifteen year warranty from curing, hardening and vapor barrier compound manufacturer under provisions of Section 01 77 00.

B. Warranty: Include coverage for removal and replacement of finish floor materials that delaminate from interior floor slabs due to moisture migration and excessive vapor emissions or due to presence of efflorescence and alkali contaminates.

1. Subfloor Moisture Conditions: Moisture emission rate of no more than 3 lb/1000 sq. ft./24 hours when tested by Quantitive Anhydrous Calcium Chloride Test, ASTM F1869, with subfloor temperature not less than 65 degrees F.

2. Subfloor Alkalinity Conditions: A pH range of between 5 to 9 when subfloor is wetted with potable water and pHdrion paper is applied.

3. Warranty to be supported by $1,000,000.00 product liability insurance policy issued directly to the Owner.

C. Provide warranty from vapor barrier manufacturer that products meet the current requirements of ASTM E1745 and will be free from material defects for the life of the building.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Provide concrete curing, finishing, and waste management techniques as defined in Section 4 of the Storm Water Best Management Practice Handbook, (BMP Handbook) Construction Edition.

2. PART 2 PRODUCTS

2.1 FORMWORK

A. As specified in Section 03 11 00.

2.2 REINFORCEMENT

A. Reinforcing steel as specified in Section 03 20 00.

2.3 FIBROUS REINFORCEMENT

A. Fibrous reinforcement as specified in Section 03 20 00.

2.4 CONCRETE MATERIALS

A. Cement: ASTM C150, Type II Portland type; low alkali; grey color.

B. Fine and Coarse Aggregates Normal Weight Concrete: ASTM C33, non reactive when tested in accordance with ASTM C289 and Appendix X-1 of ASTM C33.

C. Fine and Coarse Aggregate, Light Weight Concrete: ASTM C330.

D. Water: ASTM C1602, clean and not detrimental to concrete.

2.5 ADMIXTURES

A. Fly Ash: ASTM C618, Class F.

B. Water Reducing Admixture: ASTM C494, Type A.

C. Calcium chloride, or any other admixtures not allowable.

2.6 VAPOR BARRIER

A. Polyethylene vapor barrier film having all the following qualities:

1. Maintain permeance of less than 0.01 Perm as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).

2. Other performance criteria:

(a) Strength: ASTM E1745 Class A.

(b) Thickness: 15 mils minimum.

B. ACCESSORIES

1. Seams: Tape by vapor barrier manufacturer.

2. Sealing Penetrations of Vapor barrier:

(a) Mastic product approved by vapor barrier manufacturer.

(b) Tape approved by vapor barrier manufacturer.

3. Perimeter/terminated edge seal:

(a) Stego Crete Claw (textured tape) by Stego Industries or equal product approved by vapor barrier manufacturer.

(b) Stego Term Bar by Stego Industries or equal product approved by vapor barrier manufacturer.

(c) StegoTack Tape (double-sided sealant tape) by Stego Industries or equal product approved by vapor barrier manufacturer.

(d) One-sided seaming tape is not a recommended method of sealing at the terminated edge.

4. Penetration Prevention:

(a) Beast Foot by Stego Industries or equal product approved by vapor barrier manufacturer.

C. Manufacturers:

1. Poly-America, www.yellowguard.com.

2. Reef Industries, www.reefindustries.com.

3. Stego Industries, www.stegoindustries.com.

4. Substitutions: Under Provisions of Section 01 25 13.

2.7 ACCESSORIES

A. Underlayment: ASTM D226, Type I (No. 15) asphalt saturated roofing felt.

B. Bonding Agent: ASTM C932; Weld-Crete as manufactured by Larsen Products Corp., www.larsenproducts.com.

C. Non-shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 7000 psi in 28 days.

D. Joint Filler: ASTM D1751, 1/2 inch thick.

E. Sand Fill: Manufactured "crusher run" sand free of silt, clay, loam, friable or soluble materials or organic matters, all passing the No. 4 sieve and only 5 percent passing the No. 200 sieve.

F. Curing, Hardening and Vapor Barrier Compound: ASTM C1315, Type I, Class A and ASTM C309, Type 1, Class A, with maximum volatile organic compound (VOC) content rating as required to suit regulatory requirements. Material to have no less than 34 percent penetrating solids, have no visible sheen and be compatible with floor finish materials and overlayments. Provide the following:

1. PMC 3300 Penetrating Sealer manufactured by Curranseal, www.curranseal.com or VC-5 penetrating sealer manufactured by Sinak, www.sinak.com.

G. Sealing Compound: Ashford Formula manufactured by Curecrete Distribution, Inc., www.ashfordformula.com.

H. Slip Resistant Aggregate: 95 percent minimum fused homogeneous aluminum oxide.

I. Final Sealer: CS-309-25 by W.R.Meadows, Inc.

J. Concrete Floor Slab, Saw Cut, Joint, Crack, Repair Material: Cement-based, polymer-modified product that can be feathered at edges to match adjacent floor elevations. Compressive strength not less than 4,200 psi at 28 days when tested according to ASTM C109. Equivalent to ARDEX SD-F Feather Finish, www.ardex.com. Epoxy base to be equivalent to W. R. Meadows Rezi-Weld Flex semi-rigid epoxy, www.wrmeadows.com.

K. Substitutions: Under provisions of Section 01 25 13.

2.8 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94 ACI 318, Section 26.4.4.

B. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4,000 psi at 28 days.

2. Maximum Water-Cement Materials Ratio: 0.5.

3. Aggregate Size: 1-1/2 inch maximum.

4. Slump Limit: 4 inch minimum, 6 inch maximum.

5. Fly Ash: Maximum 25 percent by weight.

C. Foundation Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4,000 psi at 28 days.

2. Maximum Water-Cement Materials Ratio: 0.60.

3. Aggregate Size: 1-1/2 inch maximum.

4. Slump Limit: 4 inch minimum, 6 inch maximum.

5. Fly Ash: Maximum 25 percent by weight.

D. Slabs-On-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4,500 psi at 28 days.

2. Minimum Cement Materials Content: 540 lb./cu. yd.

3. Maximum Water-Cement Materials Ratio: 0.45.

4. Aggregate Size: 1 inch maximum.

5. Slump Limit: 3 inch minimum, 5 inch maximum.

6. Fly Ash: Maximum 25 percent by weight.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, held securely, and will not cause difficulty in placing concrete.

3.2 PREPARATION

A. At locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels, and pack solid with non-shrink grout.

B. Place 2 inch thick sand fill over subgrade.

C. Compact sand fill as specified in Section 31 20 00.

D. Install underlayment over wood subfloor. Lap joints 6 inches. Fasten in place.

3.3 VAPOR BARRIER INSTALLATION

A. Install vapor barrier in compliance with ASTM E1643 under interior slabs and over sand subgrade.

1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.

2. Extend vapor barrier to the perimeter of the slab. Terminate and seal vapor barrier to the foundation wall or grade beam.

(a) Seal vapor barrier to the entire slab perimeter using manufacturer’s textured tape with a surface that creates a mechanical seal to freshly placed concrete, per manufacturer’s instructions.

OR

(b) Seal vapor barrier to the entire perimeter wall or footing/grade beam with manufacturer’s double-sided tape, or both termination bar and double-sided tape, per manufacturer’s instructions. Ensure the concrete is clean and dry prior to adhering tape.

3. Overlap joints 6 inches and seal with manufacturer's seam tape.

4. Apply seam tape/textured tape/double-sided tape to a clean and dry vapor barrier.

5. Seal all penetrations (including pipes) per manufacturer's instructions.

6. Avoid the use of stakes driven through vapor barrier by utilizing screed and forming systems that will not puncture the vapor barrier.

7. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile properties.

8. Utilize vapor barrier sealing accessories from the same manufacturer as the vapor barrier membrane or other manufacturer products approved by vapor barrier manufacturer.

B. Install vapor barrier to exterior surface of below grade building foundation walls and grade beams. Seal to vertical surface of foundation wall with pressure sensitive tape and termination bar at an elevation consistent with the top of the adjacent finish grade.

3.4 PLACING CONCRETE

A. Notify Architect minimum 24 hours prior to commencement of concreting operations.

B. Place concrete in accordance with ACI 301.

C. Hot Weather Placement: ACI 305.1.

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.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete in hot weather. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

D. Cold Weather Placement: ACI 306.1.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 306.1

E. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.

F. Do not disturb or damage vapor barrier while placing concrete. Repair damage as required to maintain integrity of barrier.

G. Place concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.

H. Place interior floor slabs on fill in a strip sequence pattern.

I. Excessive honeycomb or embedded debris in concrete is not acceptable.

3.5 JOINTS

A. Saw cut control joints at an optimum time after finishing. Use 3/16 inch thick blade, cutting 1/3 into depth of slab thickness.

B. Review locations of joints when indicated and make recommendations for any additional joints or suggestions for new locations. Lack of joints or misplacement of joints will not constitute justification of slab cracking.

C. Provide control joints at 15 feet on center unless otherwise indicated.

D. Where indicated on the drawings, separate slabs from vertical surfaces with joint filler. Extend joint filler from bottom of slab to within 1/4 inch of finished slab surface.

3.6 FLOOR SLAB JOINT FILLING AND CRACK REPAIR

A. Prepare, clean, and install joint repair material according to manufacturer's written instructions.

B. Defer joint filling and crack repair until concrete has aged a minimum of 60 days.

C. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

D. Mechanically V-groove as necessary all saw cuts, joints and cracks, to a minimum width of 1/4 inch and a minimum depth of 5/8 inch.

E. Fill bottom of joint at slab on grade locations to a depth of at least 3/16 inch with semi-rigid epoxy. Omit semi-rigid epoxy at above grade slab locations.

F. Place silica sand over epoxy filler.

G. Prepare and prime joint substrate as recommended by joint repair material manufacturer.

H. Fill all saw cuts, joints, and cracks with cement based joint repair material to top of concrete surface.

I. Steel trowel edges of joint repair material to a feather edge to match adjacent floor elevation.

3.7 FINISHING OF FORMED SURFACES

A. Rough form finish:

1. Leave surfaces with the texture imparted by forms, except patch tie holes and defects.

2. Remove fins exceeding 1/4 inch in height.

3. Use for below grade foundation walls and concealed spaces.

B. Smooth form finish:

1. Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces, with number of seams kept to a practical minimum and in a uniform and orderly pattern.

2. Patch tie holes and defects.

3. Remove fins completely.

4. Use for exposed finish surfaces to receive paint.

C. Smooth rubbed finish:

1. Produce on newly hardened concrete no later than the day following form removal.

2. Wet the surfaces, and rub with carborundum brick or other abrasive until uniform color and texture are produced.

3. Do not use a cement grout other than the cement paste drawn from the concrete itself by the rubbing process.

4. Use for exposed finish surfaces to receive clear sealer.

D. Grout cleaned finish:

1. Do not start cleaning operations until all contiguous surfaces to be cleaned are completed and accessible.

2. Do not permit cleaning as the work progresses.

3. Mix one part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistency of thick paint.

4. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout and apply the grout uniformly with brushes or spray gun.

5. Immediately after applying the grout, scrub the surface vigorously with a cork float or stone to coat the surface and fill all air bubbles and holes.

6. While the grout is still plastic, remove all excess grout by working the surface with a rubber float, sack, or other means.

7. After the surface whites from drying (about 30 minutes at normal temperatures), rub vigorously with clean burlap.

8. Keep the surface damp for at least 36 hours after final rubbing.

3.8 FINISHING SLABS

A. Uniformly spread, screed and consolidate concrete. Do not spread concrete by vibration.

B. Float Finish: Float with hand float or with a powered disc float. High spots to be cut down and low spots to be filled. Use as preparation for further finishing.

C. Scratched Finish: Mechanically float surfaces. Roughen with stiff brushes before final set. Use for ceramic and porcelain tile with full bed setting systems and where indicated.

D. Troweled Finish: After floating, steel trowel to smooth, mark free surface. Use for exposed floors and slabs to receive carpeting, resilient flooring, and where indicated. Do not over trowel or burnish surface.

E. Polished Concrete Finish: As specified in Section 03 35 10.

3.9 SLAB TOLERANCES

A. Maintain slab tolerance as defined in ACI 302.1R of (SOV) F_F35 and F_L25 and (MLV) F_F24 and F_L17 as measured by ASTM E1155 for slabs on grade.

B. Correct the slab surface if the actual F_F/F_L number for the floor installation measures less than required.

C. After correction of slab surface to specified tolerance, apply curing, hardening and vapor barrier over corrected surface.

D. In areas of floor drains, maintain floor levels at the walls and slope surface uniformly to drains at 1/8 inch per foot.

3.10 CURING

A. Apply curing, hardening and vapor barrier compound on all floor slabs that are not exposed and indicated to be sealed.

B. Cure concrete surfaces in accordance with ACI 301.

C. Spray apply curing, hardening and vapor barrier compound on finished slab surfaces located below grade, at grade, and above grade in two "wet on wet" flood coats at the total rate of 200 sq. ft./gallon in accordance with manufacturer's instructions.

D. Application of compound shall be by a trained applicator acceptable to compound manufacturer.

E. After application of curing, hardening, and vapor barrier compound, moist cure concrete using the following method:

1. Spraying: Fog spray clean, potable water over floor slab areas and maintain moist for 10 days.

2. Polyethylene Film: Spread over floor slab areas, lap edges and sides, maintain in place for 10 days.

3.11 SEALING

A. Apply sealing compound on finished floor slab surfaces that are not to receive a finished floor covering and are indicated to be exposed and sealed.

B. Apply sealing compound immediately following finishing operation.

C. Apply sealing compound in sufficient quantities to keep entire surface wet for a minimum of 30 minutes.

D. Lightly mist surface with water as compound is absorbed into surface.

E. Flush surface with water and squeegee surface free of excess compound.

F. Final Seal: At the end of construction, before turning project over to the Owner, apply final sealer to all exposed concrete floors. Apply 3 coats in accordance with manufacturer's application requirements. Verify timing of application with the requirements of the sealing compound manufacturer.

3.12 MOISTURE CONTROL SYSTEM

A. Apply moisture control system on all first-floor slabs-on-grade that are scheduled to receive carpet, epoxy, resilient flooring, or athletic flooring.

B. All concrete substrates must be structurally sound and solid, and thoroughly clean and free of oil, wax, grease, asphalt, paint, latex compounds, curing and sealing compounds, and any containment that could act as a bond breaker.

C. Mechanical preparation of the surface is required to obtain a minimum ICRI concrete surface profile of 3 (CSP 3). This substrate preparation must be by mechanical means, such as shot blasting. Broom sweep and vacuum the prepared surface. Acid etching, solvents, sweeping compounds, adhesive removers and sanding are not acceptable means of cleaning the substrate.

D. Prior to beginning the installation, measure the relative humidity within the concrete (ASTM F2170). The RH shall not exceed 98%.

3.13 FINAL SEAL

A. At the end of construction, before turning project over to the Owner, apply final sealer to all exposed concrete floors. Apply 3 coats in accordance with manufacturer's application requirements. Verify timing of application with the requirements of the sealing compound manufacturer.

3.14 PATCHING

A. Notify Architect immediately upon removal of forms to determine areas that will require patching.

B. Surface defects shall include color and texture irregularities, stains, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections and discolorations in the surface that cannot be removed by cleaning.

C. Patch imperfections in accordance with ACI 301.

3.15 DEFECTIVE CONCRETE

A. Modify or replace concrete not conforming to required levels and lines, details, and elevations.

B. Repair or replace concrete not properly placed or of the specified type.

3.16 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 29.

B. Owner's Inspector will take cylinders and perform slump, air entrainment, temperatures, density, and compressive strength cylinder tests per ACI 301. Preparing compressive strength test cylinder shall be per

ACI 301 and the number of cylinders for a valid 28-day compressive strength test shall be determined in accordance with ACI 318, Item 26.12.1 (a). Project Inspector will arrange for pickup by Testing Laboratory.

C. Three cylinders will be taken for every 50 yards, or fraction thereof, for each class of concrete for each day.

D. Tests of cement and aggregates will be performed by Testing Laboratory to ensure conformance with requirements stated herein.

E. Slab tolerance as measured by ASTM E1155 shall be performed within 72 hours of floor slab installation.

F. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.17 PROTECTION

A. Protect finished work under provisions of Section 01 61 00.

B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

END OF SECTION

SECTION 03 35 10

POLISHED CONCRETE FLOOR SYSTEM

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Polished concrete floor system.

B. Concrete dye.

C. Joint filler.

1.2 REFERENCES

A. ANSI / NFSI B101.3 Wet Dynamic COF (coefficient of friction) Standard.

B. ASTM D 523 – Standard Test Method for Specular Gloss.

C. ASTM E 1155 – Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.

D. CPC - Concrete Polishing Council - Affiliate of the American Society of Concrete Contractors.

1.3 SYSTEM DESCRIPTION

A. Polished concrete floor system for new interior concrete floors by dry grinding and polishing with various size grit metal-bonded and resin-bonded diamonds and application of concrete densifier.

B. Performance Requirements: Polished concrete floor system shall meet the following criteria:

1. Static Coefficient of Friction, ANSI / NFSI B101.3 COF Test:

(a) Wet or Dry Surface: 0.41 average Ra value.

2. Specular Gloss/Reflectance, ASTM D 523:

(a) 20 Degrees: 1.2.

(b) 60 Degrees: 2.5.

(c) 85 Degrees: 0.03.

3. Floor Surface Profile, ASTM E 1155:

(a) Floor Flatness, Minimum Local Value (MLV FF): FF 24

(b) Floor Levelness, Minimum Local Value (MLV FL): FL 17

1.4 SUBMITTALS

A. Submit product data and installation instructions under the provisions of Section 01 33 00.

B. Product Data: Submit product data for densifier sealers and joint filler.

C. Instructions: Submit instructions for surface preparation and installation.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Manufacturer’s product data for VOC content of products in compliance with Section 01 81 13.

1.6 OPERATIONS AND MAINTENANCE DATA

A. Submit maintenance data under provisions of Section 01 77 00.

B. Maintenance Manual: Submit maintenance manual, including maintenance and cleaning instructions for polished concrete floor system.

1.7 QUALITY ASSURANCE

A. Installer's Qualifications: Certified CPC installer with a minimum of 5 years experience..

B. Installer's Certification: Submit CPC certification for installer and installer's employees.

C. Installer's Project References: Submit list of successfully completed polished concrete floor system projects, including project name and location, name of architect, and type and quantity of polished concrete floor system installed.

1.8 PRE-INSTALLATION CONFERENCE

A. Convene pre-installation meeting two weeks prior to commencing installation of polished concrete floor system under the provisions of Section 01 31 00.

B. Require attendance of parties directly affecting work of this Section.

C. Review surface preparation, installation, field quality control, and protection.

1.9 MOCKUP

A. Provide mockup of polished floor system under provisions of Section 01 43 00.

B. Provide a minimum of a 10'-0" x 10'-0" floor area for review.

C. Floor mockup to include to include dye [and stencil] application and a typical floor joint.

D. When accepted, mockup will demonstrate minimum standard for the Work. Mockup may remain as part of the Work.

1.10 SEQUENCING AND SCHEDULING

A. Sequence and schedule Work under provisions of Section 01 11 00.

B. Schedule Work to avoid prolonged exposure to future Work that may be detrimental to the finish work of this Section.

C. Sequence work to allow for proper application of concrete dye.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products to site under provisions of Section 01 61 00.

B. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

C. Store materials in clean, dry area indoors in accordance with manufacturer's instructions.

D. Protect materials during handling and application to prevent contamination or damage.

2. PART 2 PRODUCTS

2.1 INSTALLATION EQUIPMENT

A. Roto-Miller Planing Machine:

1. Type: Self-propelled, vertically rotating concrete planning machine
2. Weight: 700 pounds minimum
3. Grinding Width: 13 inches minimum
4. Motor: 15HP minimum
5. Cutting Disk Diameter: 10 inches minimum

B. Floor Grinder:

1. Type: Multi-orbital, planetary-action, opposing-rotational, diamond-headed floor grinder.
2. Weight: 850 pounds minimum.
3. Grinding Pressure: 675 pounds minimum.
4. Grinding Width: 32 inches minimum.
5. Motor: 15 HP minimum.
6. RPM: 1,750 maximum.
7. Head: 3-head system contours to floor surface.

C. Vacuum System:

1. Type: As required to perform required dust extraction during grinding and polishing of concrete floor.
2. Filtration: Direct-connect, HEPA filtration system.

D. Diamond Tooling for Grinding and Aggregate Exposure

1. 16/30/40 grit 10 inch diamond blade.

E. Diamond Tooling for Coating Removal:

1. 40-grit metal-bonded diamonds.
2. 80-grit metal-bonded diamonds.

F. Diamond Tooling for Initial Grinding:

1. 150-grit metal-bonded diamonds.

G. Diamond Tooling to Prepare Floor for Polishing:

1. 150-grit metal-bonded diamonds.

H. Diamond Tooling for Polishing Concrete:

1. 100-grit resin-bonded diamonds.
2. 200-grit resin-bonded diamonds.
3. 400-grit resin-bonded diamonds.
4. 800-grit resin-bonded diamonds.
5. 1,500-grit resin-bonded diamonds.
6. 3,000- grit resin -bonded diamonds.

2.2 MATERIALS

A. Permanent sealing, densifying, and hardening compound that is odorless and free of all VOCS.

B. Concrete Densifier:

1. Ameripolish, Inc., 3DHS Densifier, www.ameripolish.com.
2. Ardex, PC 50, Lithium Densifier, www.ardexamericas.com.
3. Diamatic, FlorSil, Lithium Densifier, www.diamaticusa.com.
4. Concrete Polishing Solutions , Armor Densifier MFL, www.go2cps.com.
5. L & M Construction Chemicals, Inc., FGS Hardener Plus, www.lmcc.com.
6. Perfect Polish, Impregnating Concrete Hardener, www.perfectpolishonline.com.
7. ProSoCo, Consolideck LS, www.consolideck.com.
8. Westcoat, SC-21 Lithium Silicate Densifier, www.westcoat.com.

C. Concrete Sealer:

1. Ameripolish, Inc., SR-2 Stain Resistor, www.ameripolish.com.
2. Ardex, PC Finish, www.ardexamericas.com.
3. Diamatic, Flor-Finish, www.diamaticusa.com.
4. Concrete Polishing Solutions, Armor Stain Shield MFL, www.go2cps.com
5. L & M Construction Chemicals, Inc., FGS PermaShine Petrotext, www.lmcc.com
6. Perfect Polish, Impregnating Concrete Hardener, www.perfectpolishonline.com
7. ProSoCo, Consolideck , LS Guard, www.consolideck.com.
8. Westcoat, SC-24 Polish Guard, www.westcoat.com.

D. Concrete Dye:

1. Ameripolish, Inc., Surelock Dye, www.ameripolish.com.
2. Ardex, PC Color-Dye, www.ardexamericas.com.
3. Diamatic, FLOR COLOR, www.diamaticusa.com.

4. Concrete Polishing Solutions, Concrete Dye, www.go2cps.com.

5. L & M Construction Chemicals, Inc., Vivid Dye WB Plus, www.lmcc.com.

6. Perfect Polish, Concrete Dye, www.perfectpolishonline.com.

7. ProSoCo, Gem Stone Stain, www.consolideck.com.

8. Westcoat, SC-36 Fast Stain Dye, www.westcoat.com.

E. Joint Filler: Semi-rigid, two-part, self-leveling 100 percent polyurea joint filler. Spal-Pro RS 88 as manufactured by Metzger / McGuire, www.metzgermcguire.com.

F. Substitutions: Under provisions of Section 01 25 13.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Examine floor to receive polished concrete floor system.

B. Notify Architect of conditions that would adversely affect installation or subsequent use.

C. Do not begin surface preparation or installation until unacceptable conditions are corrected.

3.2 SURFACE PREPARATION

A. Protection: Protect surrounding areas and adjacent surfaces from the following:

1. Minimal accumulation of dust from grinding and polishing.

2. Contact with overspray of concrete densifier.

3. Contact with overspray of concrete sealer.

B. Surface Preparation: Prepare surfaces in accordance with installer's instructions.

C. Clean Surfaces: Remove dirt, dust, debris, oil, grease, curing agents, bond breakers, paint, coatings, and other surface contaminants which could adversely affect installation of polished concrete floor system.

3.3 INSTALLATION

A. Install polished concrete floor system in accordance with installer's instructions at locations indicated on the Drawings.

B. Aggregate Exposure:

1. Medium Aggregate: Medium course aggregate exposure.

C. Polished Concrete Floor System: CPC Sheen Level 4 – Glossy Shine.

1. Preparation Step:

a. Begin aggregate exposure grind by running roto-miller planing machine with a maximum setting of 1/8 inch removal per pass, leaving a profiled surface.

b. Remove profile left by roto-miller planing machine by grinding with 16-grit metal-bonded diamonds.

c. Inspect the concrete surface to determine the consistency of aggregate exposed. If the aggregate is unacceptable, repeat steps a and b, removing no more than 1/8 inch of surface per pass.

d. Remove existing floor coatings and level floor by grinding with 40-grit metal-bonded diamonds.

e. Open-up concrete to accept concrete densifier by grinding with 80-grit metal-bonded diamonds.

2. Apply concrete densifier to deeply saturate floor.

3. Remove residue of concrete densifier dried on floor surface by grinding with 150-grit metal-bonded diamonds.

4. Floor Closure Polishing:

a. Remove 150-grit metal-bonded diamond scratches by grinding with 100-grit resin-bonded diamonds.

b. Remove 150-grit metal-bonded and 100-grit resin-bonded diamond scratches by grinding with 200-grit resin-bonded diamonds.

c. Prepare floor for polishing by grinding with 400-grit resin-bonded diamonds.

d. Achieve light-reflective finish when viewed from a distance of 30 feet by grinding with 800-grit resin-bonded diamonds.

5. Final Polish:

a. Start final polish by grinding with 1,500-grit resin-bonded diamonds.

b. Complete final polish by grinding with 3,000-grit resin-bonded diamonds.

6. Apply concrete sealer.

3.4 CONCRETE DYE INSTALLATION

A. Concrete Dye:

1. Apply dye prior to final polishing stage in areas as indicated on drawings.

2. Divide areas to receive dye into small work areas using walls, joint lines, or other stationary natural stopping points.

3. Mix dye with water or acetone as recommended by manufacturer to achieve color required.

4. Apply dye evenly over surface in quantities as recommended by manufacturer to achieve color and finish required.

5. Apply dye uniformly by brush or pump sprayer. Maintain a wet edge.

6. Apply dye in as many as 3 coats to provide even density of color required.

7. Allow to dry a minimum of 60 minutes between coats.

8. Remove all excess dye remaining prior to topcoat and sealer.

9. Remove excess dye with water and mild detergent using floor scrubber.

10. Protect dyed concrete surfaces from traffic until they are sealed.

11. Apply sealer as recommended by manufacturer at rate required to achieve finish required.

3.5 JOINT FILLER INSTALLATION

A. Defer installation until a minimum of 28 days after slab installation.

B. Where joints have minor edge chips, said chips shall be squared-off and filled along with the joint itself.

C. Install filler material according to manufacturer's instructions. Coordinate with polishing operations.

D. Thoroughly clean all joints to their full depth. Remove all dust and debris.

E. Install backer rod in construction joints at a minimum depth of 2 inches. Do not install backer rod in saw-cut control joints.

F. Fill joints to slightly overflowing condition. After filler is fully cured, razor cut off excess to flush profile.

3.6 FIELD QUALITY CONTROL

A. Inspect completed polished concrete floor system with Owner, Contractor, Architect, and Installer.

B. Review procedures with Architect to correct unacceptable areas of completed polished concrete floor system.

3.7 PROTECTION

A. Protect completed polished concrete floor system from damage until Substantial Completion.

1. Do not allow vehicle and pedestrian traffic on unprotected floor.

2. Do not allow construction materials, equipment, and tools on unprotected floor.

B. Immediately remove mortar splatter, spilled liquids, oil, grease, paint, coatings, and other surface contaminants which could adversely affect completed polished concrete floor system.

C. Repair damaged areas of completed polished concrete floor system to satisfaction of Architect.

END OF SECTION

SECTION 04 05 13

MASONRY MORTAR

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Mortar and grout for masonry.

1.2 REFERENCES

A. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

B. ASTM C144 - Aggregate for Masonry Mortar.

C. ASTM C150 - Portland Cement.

D. ASTM C207 - Hydrated Lime for Masonry Purposes.

E. ASTM C270 - Mortar for Unit Masonry.

F. ASTM C404 - Aggregates for Masonry Grout.

G. ASTM C476 - Grout for Masonry.

H. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture for Concrete.

1.3 SUBMITTALS

A. Submit samples under provisions of Section 01 33 00.

B. Submit two ribbons of mortar color, illustrating color and color range.

1.4 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Credit MR 4, submit data for content of post-industrial recycled content under provisions of Section 01 81 13.

1.5 STORAGE AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperatures to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

1.7 MIX DESIGN

A. Submit design mix prepared by a California Registered Civil Engineer to testing laboratory and Architect for review.

2. PART 2 PRODUCTS

2.1 MATERIALS

A. Portland Cement: ASTM C150, Type I, low alkali, gray color.

B. Mortar Aggregate: ASTM C144, standard masonry type, non reactive.

C. Hydrated Lime: ASTM C207, Type S.

D. Grout Aggregate: ASTM C404.

E. Fly Ash: ASTM C618, Class F.

F. Water: Clean and potable.

2.2 MORTAR COLOR

A. Mortar Color: Natural and synthetic mineral oxides, compounded for use in mortar mixes. Provide one of the following:

1. SGS Mortar Colors; Solomon Grind-Chem Services, Inc., www.solomoncolors.com.

2. True Tone Mortar Colors, Davis Colors, subsidiary of Rockwood Industries, Inc., www.daviscolors.com.

3. Substitution: Under provisions of Section 01 25 13.

B. Color: As selected by Architect from manufacturer's complete range. Up to four(4) different colors will be selected for use in varying amounts at all mortar locations.

2.3 ADMIXTURES

A. Water Repellant: Liquid type; Dry Block as manufactured by GCP Applied Technologies, www.gcpat.com or MasterPel 240MA as manufactured by Master Builders, Inc., www.master-builders-solutions.basf.us.

B. Sika Grout Aid as manufactured by Sika Corp., www.sikausa.com.

C. Substitutions: Under provisions of Section 01 25 13.

2.4 MORTAR MIXES

A. Comply with ASTM C270, Proportion Specification. Limit fly ash content to 15 percent maximum.

1. Mortar for masonry below grade and in contact with earth: Type M.

2. Mortar for reinforced masonry: Type S.

3. Pointing Mortar: Type N, with maximum 2 percent ammonium stearate or calcium stearate per cement weight.

4. Mortar for glass unit masonry: Type S.

B. Acceptable Alternative: Mix Preblended Masonry Mortars as manufactured by E-Z Mix, Inc., or Amerimix.

2.5 MORTAR MIXING

A. Thoroughly mix mortar ingredients in quantities needed for immediate use.

B. Add mortar color in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.

C. Add water-repellant admixture to all exterior mortar in quantities recommended by manufacturer for type of mortar mix used.

D. Do not use anti-freeze compounds to lower the freezing point of mortar.

E. If water is lost by evaporation, retemper only within 2 hours of mixing.

F. Use mortar within two hours after mixing at temperatures of 80 degrees F, or 2-1/2 hours at temperatures under 40 degrees F.

G. Mortar which has hardened or stiffened due to hydration of cement shall not be used.

2.6 GROUT MIXES

A. Comply with ASTM C 476 for grout in reinforced and non-reinforced unit masonry: 2000 psi strength at 28 days.

1. Fine Grout: spaces less than 2 inches in horizontal dimension.

2. Coarse Grout: spaces 2 inches or more in least horizontal dimension.

3. Mix 1 lb of grout aid per 100 lbs of cementitious materials.

4. Limit fly ash content to 25 percent maximum.

2.7 GROUT MIXING

A. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476.

B. Do not use anti-freeze compounds to lower the freezing point of grout.

3. PART 3 EXECUTION

3.1 PREPARATION

A. Plug cleanout holes with masonry units to prevent leakage of grout materials. Brace masonry for wet grout pressure.

3.2 INSTALLATION

A. Install mortar and grout to requirements of the specific masonry Section.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not displace reinforcement while placing grout.

D. Remove grout spaces of excess mortar.

3.3 FIELD QUALITY CONTROL

A. Testing and analysis of mortar and grout will be performed under provisions of Section 01 45 29.

END OF SECTION

SECTION 04 20 00

UNIT MASONRY

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete masonry units.

B. Reinforcement, anchorage, and accessories.

1.2 REFERENCES

A. ASTM C90 - Load-Bearing Concrete Masonry Units.

B. ASTM D226 - Asphalt Saturated Organic Felt Used in Roofing and Waterproofing.

C. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

D. ASTM D2000 - Rubber Properties in Automotive Applications.

E. ASTM D2240 - Rubber Property - Durometer Hardness.

F. UL - Underwriters' Laboratories.

G. MSJC - Masonry Standards Joint Committee (ACI 530/ASCE 5/TMS 402).

1.3 SUBMITTALS

A. Submit samples under provisions of Section 01 33 00.

B. Submit two samples of each type of unit to illustrate color, texture and extremes of color range.

C. Submit manufacturer's certificate under provisions of Section 01 33 00 that products meet or exceed specified requirements.

D. Submit high lift grouting methods to Architect and testing laboratory for review.

1.4 REGULATORY REQUIREMENTS

A. Conform to UL requirements for fire rated masonry construction.

1.5 MOCK-UP

A. Provide mock-up of composite masonry under provisions of Section 01 43 00.

B. Erect panel 6 feet long by 4 feet high by full thickness.

C. When accepted, mock-up will demonstrate minimum standard for the Work. Mock-up may not remain as part of the Work.

1.6 STORAGE, AND HANDLING

A. Store and protect products under provisions of Section 01 61 00.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Weather Requirements: MSJC - Masonry Standards Joint Committee, Hot and Cold Weather Masonry Construction Manual (ACI 530/ASCE 5/TMS 402).

1.8 SEQUENCING AND SCHEDULING

A. Coordinate work under provisions of Section 01 31 00.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS - CONCRETE MASONRY UNITS

A. Angelus Block, Co., Inc. www.angelusblock.com.

B. Orco Block Co., Inc., www.orco.com.

C. RCP Block and Brick, Inc., www.rcpblock.com.

D. Substitutions: Under provisions of Section 01 25 13.

2.2 CONCRETE MASONRY UNITS

A. Hollow Load Bearing Block Units: ASTM C90, medium weight. Masonry units shall be single or double open end units as required for proper installation.

B. All exterior concrete masonry units shall contain Dry Block, an integral water-repellant admixture as manufactured by GCP Applied Technologies, www.gcpat.com or MasterPel 240 as manufactured by Master Builders, Inc., www.master-builders-solutions.basf.us.com. Quantity of admixture to be in accordance with manufacturer's recommendations.

C. Provide single, double, and triple faced units as required for all exposed surfaces:

1. Single Vertical Score Burnish Units: Provide at all locations indicated on drawings.

2. Precision Units: Provide at all exterior and interior exposed and interior concealed locations where not otherwise indicated. Provide at all structural bearing connection locations, intersection with interior dissimilar partitions, at all electrical cover plates, thermostats, and elsewhere as indicated on drawings.

3. Cap Blocks: Provide 2 inch thick solid units at all locations indicated on drawings.

D. Color:

1. Single Vertical Score Burnish Units: Orco, to match the existing CMU wall color on the property. Color as selected by Architect from the manufacturer's complete range of colors.

2. Smooth Units: Orco Grey, at conceal locations, and to match the existing CMU wall color on the property and to be install adjacent to the neighbors to the west. Color as selected by Architect from the manufacturer's complete range of colors.

3. Cap Blocks: Orco, to match the existing CMU wall caps on the property and to be install adjacent to the neighbors to the west and other depicted locations. Color as selected by Architect from the manufacturer's complete range of colors.

E. Masonry Units: Nominal modular sizes as indicated on drawings. Provide special units for, bond beams, lintels and other shapes indicated, or make up from saw cut units as indicated.

2.3 MORTAR AND GROUT

A. Mortar: Type specified in Section 04 05 13.

B. Grout: Type specified in Section 04 05 13.

2.4 REINFORCEMENT AND ANCHORAGE

A. Reinforcing Steel: Type specified in Section 03 20 00; sizes indicated.

B. Anchors: Types and sizes indicated and required for intended use.

2.5 ACCESSORIES

A. Cleaning Solutions: Non-acidic, not harmful to masonry work or adjacent materials.

B. Preformed Expansion Joints: ASTM D2000, designation 2AA-805, rubber material with durometer hardness of 80 when tested in accordance with ASTM D2240. Provide with corner and tee accessories, fused joints.

C. Joint Filler: ASTM D1056, Type 2, Class A, Grade 1, closed cell neoprene oversized 35 percent to joint width.

D. Building Paper: ASTM D226, Type I (No. 15) asphalt saturated felt.

3. PART 3 EXECUTION

3.1 EXAMINATION

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

B. Verify items provided by other Sections of work are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

D. Beginning of installation means installer accepts existing conditions.

3.2 PREPARATION

A. Direct and coordinate placement of metal anchors supplied by other Sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

C. Roughen masonry contact surface of foundation and floors by exposing clean aggregate.

3.3 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Lay concrete masonry units in running bond. Course one unit and one mortar joint to equal 8 inches. Form rake mortar joints.

3.4 PLACING AND BONDING

A. Lay hollow masonry units with face shell bedding on head and bed joints.

B. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.

C. Remove excess mortar as Work progresses.

D. Interlock intersections and external corners.

E. Where detailed, Intersections of perpendicular walls to be flush. Rake joint at exposed unit faces for placement of backer rod and sealant.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

H. Cut mortar joints flush where plaster is directly applied.

3.5 REINFORCEMENT

A. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

3.6 ANCHORAGES

A. Embed anchors embedded in concrete and embed anchorages at 16 inches on center vertically in mortar joint unless indicated otherwise.

3.7 REINFORCED UNIT MASONRY

A. Lay masonry units with core cells vertically aligned clear of mortar and unobstructed.

B. Place mortar in masonry unit bed joints back 1/4 inch from edge of unit grout spaces, bevel back and upward. Permit mortar to cure 3 days before placing grout for high lift grouting and 24 hours for low lift grouting.

C. Reinforce masonry unit cores with reinforcement bars and grout as indicated.

D. Retain vertical reinforcement in position at top and bottom of cells and at intervals not exceeding 160 bar diameters. Do not splice between lateral support unless otherwise indicated.

E. Brace reinforcement and secure in place to allow no movement during grouting.

F. Grouting:

1. Use Fine Grout per Section 04 05 13 for filling spaces less than 2 inches in one or both horizontal directions.

2. Use Coarse Grout per Section 04 05 13 for filling spaces 2 inches or larger in both horizontal directions.

3. Grouting Technique: Low-lift grouting technique subject to requirements specified below. Optional high lift grouting technique may be used subject to requirements specified below.

G. Low-Lift Grouting:

1. Provide minimum clear dimension of 2 inch and clear area of 8 sq. in. in vertical cores to be grouted.

2. Place vertical reinforcement prior to laying of masonry units. Extend above elevation of maximum pour height as required for splicing.

3. Lay masonry units to maximum pour height. Do not exceed 12'-8" height, or if bond beam occurs below this height, stop pour at course below bond beam.

4. Pour grout using chute or container with spout. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than 1 hour. Terminate grout pours 1-1/2 inches below top course of pour.

5. Bond Beams: Stop grout in vertical cells 1-1/2 inches below bond beam course. Place horizontal reinforcement in bond beams; lap at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.

H. High-Lift Grouting:

1. Do not use high-lift grouting technique for grouting unless minimum cavity dimension and area is 3 inch and 10 sq.in., respectively.

2. Provide cleanout holes in first course at all vertical cells which are to be filled with grout. Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell.

3. Construct masonry to full height of maximum grout pour specified, prior to placing grout. Limit grout lifts to a maximum height of 6 feet and grout pour to a maximum height of 24'-0", for single wythe hollow masonry walls, unless otherwise indicated.

4. Place vertical reinforcement before grouting. Place before or after laying masonry units, as required by job conditions. Tie vertical reinforcement to dowels at base of masonry where shown and thread masonry over or around reinforcement.

5. Place horizontal beam reinforcement as the masonry units are laid.

6. Preparation of Grout Spaces: Prior to grouting, inspect and clean grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close cleanout holes and brace closures to resist grout pressures.

7. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.

8. Limit grout pours to sections which can be completed in one working day with not more than one hour interruption of pouring operation. Place grout in lifts which do not exceed 4 feet. Allow not less than 30 minutes, or more than one hour between lifts of a given pour. Vibrate each grout lift during pouring operation. Place grout in lintels or beams over openings in one continuous pour.

9. Where bond beam occurs more than one course below top of pour, fill bond beam course to within 1 inch of vertically reinforced cavities, during construction of masonry.

10. When more than one pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within 1-1/2 inches of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if more pours are required.

3.8 CONTROL JOINTS

A. Size control joint in accordance with Section 07 92 00 for sealant performance.

B. Form control joint with a sheet building paper bond breaker fitted to one side of masonry unit. Fill resultant joint with mortar. Rake joint at exposed unit faces for placement of backer rod and sealant.

C. Form control joints using half size masonry units as required in running bond.

D. Locate joints in concrete masonry unit walls at intervals not to exceed 24 feet unless indicated otherwise.

E. Continue horizontal reinforcement through control joint.

3.9 EXPANSION JOINTS

A. Do not continue reinforcement through expansion joints.

B. Install preformed expansion joint material in continuous lengths.

C. Form expansion joints using half size masonry units as required in running bond.

D. Size expansion joints in accordance with Section 07 92 00 for sealant performance.

E. Form expansion joints as detailed.

3.10 BUILT-IN WORK

A. As work progresses, build in metal door frames window frames, wood nailing strips, anchor bolts, plates and other items furnished by other Sections.

B. Build in items plumb and level.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.

D. Do not build in organic materials subject to deterioration.

3.11 TOLERANCES

A. Maximum Variation From Alignment of Columns and Pilasters: 1/4 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation From Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

D. Maximum Variation From Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation From Level Coursing: 1/8 inch in 4 feet and 1/4 inch in 12 feet maximum.

F. Maximum Variation of Joint Thickness: 1/8 inch in 4 feet.

G. Maximum Variation From Cross Sectional Thickness of Walls: 1/4 inch.

3.12 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves and grounds. Coordinate with other Sections of work to provide correct size, shape, and location.

B. Obtain Architect's approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.13 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 29.

3.14 CLEANING

A. Clean work under provisions of Section 01 77 00.

B. Remove excess mortar and mortar smears as work progresses.

C. Replace defective mortar. Match adjacent work.

D. Clean soiled surfaces with non-acid cleaning solution.

E. Use non-metallic tools in cleaning operations.

3.15 RECYCLING CONSTRUCTION WASTE

A. Recycle masonry waste under the provisions of Section 01 74 19.

3.16 PROTECTION OF FINISHED WORK

A. Protect finished installation under provisions of Section 01 61 00.

B. At the end of each days work and during times of inclement weather cover top of masonry wall with polyethylene sheeting. Extend covering down each side of wall for a distance of 2 feet minimum. Secure in place to avoid displacement.

C. Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

END OF SECTION

SECTION 04 73 00

MANUFACTURED STONE MASONRY

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufactured stone veneer.

B. Trim shapes.

C. Mortar.

D. Metal lath.

E. Underlayment.

F. Anchorage, and accessories.

1.2 REFERENCES

A. ASTM C847 - Standard Specifications for Metal Lath.

B. ASTM C932 - Surface-Applied Bonding Agents for Exterior Plaster.

C. ASTM C1063 - Installation of Lathing and Furring for Portland Cement Based Plaster.

D. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, part 2.

E. MSJC - Masonry Standards Joint Committee (ACI 530/ASCE 5/TMS 402).

F. NAAMM - Standard ML/SFA 920 - Guide Specifications for Metal Lathing and Furring.

G. UL 723 - Test for Surface Burning Characteristics of Building Materials.

H. TSIB - Technical Service and Information Bureau.

1.3 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Submit product data for stone veneer units and accessories.

C. Submit samples under provisions of Section 01 33 00.

D. Submit two samples of stone veneer units to illustrate color, texture and extremes of color range.

E. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

F. Provide underlayment manufacturer’s written installation instructions.

1.4 REGULATORY REQUIREMENTS

A. Conform to CBC – California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Chapter 14.

1.5 QUALITY ASSURANCE

A. Installer: Company specializing in performing the work of this Section with minimum five years documented experience.

B. Installation of underlayment and penetration flashing shall be in accordance with manufacturer's installation guidelines and recommendations. Provide site reports from manufacturer's field service representative, indicating observation of underlayment and flashing installation.

1.6 MOCK-UP

A. Provide mock-up of stone veneer wall under provisions of Section 01 43 00.

B. Erect stone veneer to 3 x 4 feet panel size, include specified mortar, attachments and accessories.

C. When accepted, mock-up will demonstrate minimum standard for the Work. Mock-up may remain as part of the Work.

1.7 PRE-INSTALLATION CONFERENCE

A. Convene a conference two weeks prior to commencing work of this Section under the provisions of Section 01 31 00.

B. Require the attendance of parties directly affecting the Work of this Section.

C. Review requirements for installation of all materials specified in this Section for sequencing, proper installation, integration and protection.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products to site under provisions of Section 01 61 00.

B. Accept stone units on site. Inspect for damage.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Weather Requirements: MSJC - Masonry Standards Joint Committee, Hot and Cold weather Masonry Construction Manual (ACI 530/ASCE 5/TMS 402).

1.10 SEQUENCING AND SCHEDULING

A. Coordinate work under the provisions of Section 01 31 00.

1.11 WARRANTY

A. Provide ten year warranty for underlayment and flashings under provisions of Section 01 77 00.

B. Warranty: Include coverage for published water infiltration properties of underlayment and flashings installed for exterior walls and openings.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS - STONE VENEER

A. Coronado Stone, www.coronado.com.

B. Cultured Stone, www.westlakeroyalbuildingproducts.com/stone/cultured-stone.

C. Eldorado Stone LLC, www.westlakeroyalbuildingproducts.com/stone/eldorado-stone.

D. Substitutions: Under provisions of Section 01 25 13.

2.2 STONE VENEER

A. Stone: Country Ledge Stone type as manufactured by Cultured Stone.

B. Color: As selected by Architect from manufacturer's complete range.

C. Weight: 8 to 10 lb/sq ft.

D. Trim Shapes:

1. Watertable/Sill: 2.5" x 18 x 13" Chiseled.

2. Color: As selected by Architect as manufactured by Coronado Stone Products complete range.

E. Fire Hazard Classification: Flame spread of O, smoke development of O in accordance with UL723.

2.3 MANUFACTURERS - LATHING MATERIALS

A. Lathing Materials:

1. CEMCO, www.cemcosteel.com.

2. ClarkDietrich Building Systems, www.clarkdietrich.com

3. Clark Western Building Systems, www.westsidebmc.com.

B. Accessories:

1. CEMCO, www.cemcosteel.com.

2. ClarkDietrich Building Systems, www.clarkdietrich.com.

3. Clark Western Building Systems, www.westsidebmc.com.

4. Stockton Wire Products, www.stocktonproducts.com.

5. Substitutions: Under provisions of Section 01 25 13.

C. Substitutions: Under provisions of Section 01 25 13.

2.4 FURRING AND LATHING

A. Metal Lath for Vertical Surfaces: ASTM C847, 3.4 lb/sq yd expanded metal, galvanized, self furring type with continuous groove.

B. Underlayment:

1. Underlayment: Tyvek as manufactured by E.I. DuPont de Nemours, www.tyvek.com

(a) First layer: Commercial Wrap D.

(b) Second layer: Commercial Wrap.

2. Other acceptable underlayment: Dryline Building Wrap and Rain Drain as manufactured by National Shelter Products, Inc., www.nationalshelter.com.

C. Substitutions: Under provisions of Section 01 25 13.

2.5 ACCESSORIES

A. Weep Screed: Equivalent to Stockton WS#7, minimum 0.0179 inch thick; depth governed by plaster thickness, minimum 3-1/2 inch high flange, "V" shaped, of longest possible lengths; galvanized finish.

B. Anchorages: Nails, staples, or other approved metal supports, of type and size to suit application, galvanized to rigidly secure lath and associated metal accessories in place.

C. Penetration Flashing: Tyvek flashing system. Straight Flash for jambs and heads, Flex Wrap for sills. Equivalent as manufactured by National Shelter Products, Inc.

D. Tape: Acrylic adhesive backed oriented polypropylene, 3 inch wide.

E. Bonding Agent: ASTM C932; type recommended for bonding plaster to concrete and concrete masonry surfaces. Larsen Products Corp. - Weld-Crete, www.larsenproducts.com.

F. Cleaning Solution: Non-acid, not harmful to stone veneer or adjacent materials.

G. Water Repellent: As specified in Section 07 19 00.

H. Substitutions under provisions of Section 01 25 13.

2.6 MORTAR AND GROUT

A. MVIS Thin Brick Mortar as manufactured by Laticrete, www.laticrete.com.

2.7 FLASHINGS

A. Flexible Flashing: 5 oz/sq.ft. sheet copper coated both sides with fabric.

1. Multi-Flash 500 manufactured by York Manufacturing, www.yorkflashings.com.

2. Copper Fabric Flashing manufactured by Advanced Building Products, www.advancedbuildingproducts.com.

3. Copper Fabric Flashing manufactured by Hohmann & Barnard, Inc., www.h-b.com.

B. Substitutions: Under provisions of Section 01 25 13.

3. PART 3 EXECUTION

3.1 INSPECTION

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

B. Verify items provided by other sections of work are properly sized and located.

C. Masonry and Concrete: Verify joints are cut flush and surface is ready to receive work of this Section. Verify no bituminous or water repellent coatings exist on surface.

D. Grounds and Blocking: Verify items within walls for other Sections of work have been installed.

E. Verify that underlayment is in place and ready to receive work of this section.

F. Beginning of installation means installer accepts existing conditions.

3.2 PREPARATION

A. Direct and coordinate placement of metal anchors supplied by other Sections.

B. Clean masonry and concrete surfaces of foreign matter. Clean surfaces using acid solutions, solvents, or detergents. Wash surfaces with clean water.

C. Apply bonding agent to masonry concrete in accordance with manufacturer's instructions.

3.3 INSTALLATION - LATHING MATERIALS

A. Install metal lathing in accordance with ML/SFA 920, ASTM C1063 and as specified herein.

B. On vertical surfaces apply 2 layers of underlayment over substrate; weatherlap horizontal edges 6 inches, vertical edges 6 inches. Fasten in place at 12 inches on center vertically over stud. Tape seal all joints and penetrations. Installation to conform to Single " Separate " Layer Method in accordance with TSIB Bulletin 60.220.

C. Install penetration flashing around all openings and penetrations in exterior walls, soffits and ceilings in compliance with underlayment manufacturers recommendations and in conformance with recommendations contained in Plaster and Lathing Systems Manual and ML/SFA 920. Turn sill flashing up 6 inches at jambs. Extend flashing back onto sill, jamb, and head of all openings.

D. Apply metal lath taut, with long dimension perpendicular to supports for vertical surfaces.

E. Lap ends minimum 1 inch. Secure end laps with tie wire where they occur between supports.

F. Lap sides of expanded metal lath minimum 1-1/2 inches. Nest outside ribs of rib lath together.

G. Furr out metal lath from vertical supports or backing not less than 1/4 inch. Furring of metal lath on vertical supports having a bearing surface width of 1-5/8 inches or less is not required.

H. Attach metal lath to wood supports using 1-1/2 inch No. 11 galvanized nails with 7/16 inch diameter heads at maximum 6 inches on center.

I. Attach metal lath to vertical metal supports with tie wires or No. 8 self tapping screws with 3/8 inch diameter wafer head capable of penetrating metal supports by not less than 1/4 inch. Maximum spacing 6 inches on center.

J. Place strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

K. Place 4 inch wide strips of metal lath centered over junctions of dissimilar backing materials. Secure rigidly in place.

L. Place weep screed at base of all vertical plaster applications at foundation line not less than 4 inches above earth or 2 inches above paved surfaces. Underlayment and lath shall cover and terminate on the attachment flange of the screed.

M. Install accessories to lines and levels.

3.4 INSTALLATION - MORTAR BED

A. Apply mortar bed scratch coat over surfaces to a thickness of 1/2 to 3/4 inch.

B. Allow scratch coat to cure for 48 hours.

C. Shall be installed to provide a bond strength with a working shear of 50 PSI.

3.5 PLACING AND BONDING

A. Apply stone working from the bottom up.

B. Apply mortar to back of stone units and press firmly in place.

C. Place units in jointless/dry stack installation in accordance with the manufacturer’s instructions.

D. Perform necessary cutting with proper tools to provide uniform edges.

3.6 VENEER FLASHINGS

A. Extend flashings under stone veneer, turn up minimum 8 inches and weather lap with underlayment.

B. Install flashing at all window sills, door and window heads, and above shelf angles.

C. Form flashing up into pan at jamb of window sills and at jamb of window and door heads.

D. Lap end joints minimum 6 inches and seal watertight.

E. Use flashing manufacturer's recommended adhesive and sealer.

3.7 RECYCLING CONSTRUCTION WASTE

A. Recycle masonry waste under the provisions of Section 01 74 19.

3.8 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 29.

3.9 CLEANING

A. Clean work under provisions of Section 01 77 00.

B. Remove excess mortar and mortar smears.

C. Replace defective mortar. Match adjacent work.

D. Clean soiled surfaces with cleaning solution.

E. Use non-metallic tools in cleaning operations.

3.10 WATER REPELLANT

A. Apply water repellant as specified in Section 07 19 00.

3.11 STONE VENEER APPLICATION SCHEDULE

A. Exterior Vertical Surface of Building Walls: Stone veneer over metal lath.

B. Exterior Vertical Surface of Framed Walls: Stone veneer over metal lath and underlayment.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural steel framing members and support members.

B. Baseplates, and anchor bolts.

C. Grouting under baseplates.

1.2 REFERENCES

A. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

B. ASTM A36 - Carbon Structural Steel.

C. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.

D. ASTM A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality.

E. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

F. ASTM A325 - High Strength Bolts for Structural Steel Joints.

G. ASTM A490 - Structural Bolts, alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.

H. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.

I. ASTM A992 - Standard Specification for Steel for Structural Shapes for Use in Building Framing.

J. ASTM C1107 - Packaged Dry, Hydraulic Cement Grout (non shrink).

K. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105 KSI Yield Strength.

L. AWS A2.4 - Standard Welding Symbols.

M. AWS D1.1 - Structural Welding Code - Steel.

N. ANSI / ASCE 360 - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

O. ANSI / ASCE 303 - Specification for Architectural Exposed Structural Steel.

P. SSPC - The Society for Protective Coatings.

Q. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings:

1. Indicate profiles, sizes, spacing, and locations of structural members, connections, cambers and loads.

2. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Manufacturer's Mill Certificate: Submit under provisions of Section 01 33 00 certifying that products meet or exceed specified requirements.

D. Mill Test Reports: Submit under provisions of Section 01 33 00 Manufacturer's Certificates, indicating structural strength and destructive and non-destructive test analysis.

E. Welders' Certificates: Submit under provisions of Section 01 33 00, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

F. Architectural Exposed Structural Steel: Submit under provisions of Section 01 33 00. Provide full text of ANSI / AISC 303, Chapter 10.

1.4 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit data for content of post-consumer and pre-consumer recycled content under provisions of Section 01 81 13.

1.5 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC-Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

B. Perform Work in accordance with AISC - Specification for Architectural Exposed Structural Steel where indicated on the drawings.

C. Category for Architecturally Exposed Structural Steel (AESS) shall be 4C.

1.6 QUALIFICATIONS

A. Design connections not detailed on the Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of California.

B. Design connections in accordance with CBC California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Chapter 22.

1.7 MOCKUP

A. Provide mockup of Architecturally Exposed Structural Steel under provisions of Section 01 43 00.

B. When accepted, mockup will demonstrate minimum standard for the Work. Mockup may remain as part of the Work.

C. Coordinate painting requirements with Section 09 90 00.

2. PART 2 PRODUCTS

2.1 MATERIALS

A. Provide structural steel with a minimum post consumer recycled content of 75 percent.

B. Structural Steel Members: ASTM A36. W and WT shapes, ASTM A992.

C. Structural Tubing: ASTM A500, Grade B.

D. Steel Pipe: ASTM A53, Grade B.

E. Shear Stud Connectors: ASTM A108, Grade 1015, forged steel, headed, unfinished.

F. Threaded Bolts, Nuts, and Washers: ASTM A325 and A-490.

G. Anchor Bolts: ASTM A307. ASTM F1554 if over 9-1/2 inches long.

H. Welding Materials: AWS D1.1; type required for materials being welded.

I. Grout: ASTM C1107, non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 28 days.

2.2 FABRICATION

A. Fabricate structural steel members in accordance with AISC Specification.

B. Fabricate Architecturally Exposed Structural Steel in accordance with category designated.

C. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

2.3 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP-2.

B. Prepare Architecturally Exposed Structural Steel in accordance with SSPC-6.

C. Shop and Touch-Up Primer: SSPC 15, Type 1, Red Oxide.

D. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded or in contact with concrete or masonry.

E. Finish: Site paint exposed to view structural steel members under provisions of Section 09 90 00.

2.4 SOURCE QUALITY CONTROL AND TESTS

A. Testing and analysis of components will be performed under provisions of Section 01 45 29.

3. PART 3 EXECUTION

3.1 EXAMINATION

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

B. Beginning of installation means erector accepts existing conditions.

3.2 ERECTION

A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.

B. Field weld components indicated on Drawings.

C. Field connect members with threaded fasteners indicated; torque to required resistance.

D. Do not field cut or alter structural members without approval of Architect.

E. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

F. Erect Architecturally Exposed Structural Steel in accordance with category designated.

3.3 GROUTING

A. Clean concrete on masonry bearing surfaces.

B. Roughen bearing surface prior to setting base and bearing plates.

C. Set base and bearing plates on wedges, shims, or setting nuts.

D. Tighten anchor bolts after members are positioned and plumb.

E. Cut off protruding wedges or shims flush with edge of base or bearing plate.

F. Pack grout solidly between bearing surfaces and plates so no voids remain.

G. Finish exposed surfaces, protect installed materials, and allow to cure.

3.4 ERECTION TOLERANCES

A. Erect structural steel members in accordance with AISC Specification.

B. Erect Architecturally Exposed Structural Steel in accordance with category designated.

3.5 RECYCLING CONSTRUCTION WASTE

A. Recycle excess materials waste under the provisions of Section 01 74 19.

3.6 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 29.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shop fabricated ferrous metal items, galvanized and prime painted.

B. Schedule of metal fabrications.

1.2 REFERENCES

A. ASTM A36 - Structural Steel.

B. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

C. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

D. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

E. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.

F. ASTM A492 - Standard Specification for Stainless Steel Rope Wire.

G. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

H. ASTM A741 - Standard Specification for Metallic-Coated Steel Wire Rope and Fittings for Highway Guardrail.

I. ASTM A780 - Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

J. AWS A2.4 - Standard Welding Symbols.

K. AWS D1.1 - Structural Welding Code - Steel.

L. AWS: D1.6 - Structural Welding Code - Stainless Steel.

M. SSPC - The Society for Protective Coatings.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

C. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.4 QUALIFICATIONS

A. Welders' Certificates: Submit under provisions of Section 01 33 00, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

B. Stainless Steel Fabricator: Company specializing in the fabrication of highly finished stainless products capable of performing the work of this section with a minimum 5 years documented experience.

1.5 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on Drawings.

2. PART 2 PRODUCTS

2.1 MATERIALS

A. Steel Sections: ASTM A36.

B. Steel Tubing: ASTM A500, Grade B.

C. Plates: ASTM A36.

D. Pipe: ASTM A53, Grade B, Schedule 40.

E. Bolts, Nuts, and Washers: ASTM A307 galvanized to ASTM A153 for galvanized components.

F. Zinc-coated Steel Wire Rope: ASTM A741

1. Wire Rope Fittings: Hot-dip galvanized - steel connectors capable of sustaining load equal to minimum breaking strength of wire rope.

G. Stainless Steel Wire Rope: ASTM A492, Type 316.

1. Wire Rope Fittings: Stainless steel connectors, Type 316, capable of sustaining load equal to minimum breaking strength of wire rope.

H. Welding Materials: AWS D1.1; type required for materials being welded.

I. Shop and Touch Up Primer: SSPC 15, Type 1, red oxide.

J. Touch-Up Primer for Galvanized Surfaces: SSPC 20.

2.2 FABRICATION, GENERAL

A. Fit and shop assemble in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by continuous welds unless indicated otherwise.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 FINISHES

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime paint items with one coat.

D. Galvanize assembled items to minimum 1.25 oz/sq ft zinc coating in accordance with ASTM A123.

E. Repair damaged galvanized surfaces in accordance with ASTM A780 Method A2.

F. Finish: Site paint exposed to view prime painted and galvanized items under provisions of Section 09 90 00.

G. Stainless Steel Finish: No. 4 brushed finish as indicated; Co. 8 Mirror Finish as indicated.

3. PART 3 EXECUTION

3.1 EXAMINATION

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

B. Beginning of installation means erector accepts existing conditions.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate sections.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components indicated on Drawings.

D. Perform field welding in accordance with AWS D1.1.

E. Obtain Architect approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.4 SCHEDULE

A. The Schedule is a list of principal items only. Refer to Drawing details for items not specifically scheduled.

B. Miscellaneous Framing and Supports: Steel not a part of structural steel framework as required to complete work; galvanized finish.

C. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; polyethylene cover finish.

D. Joist Hangers: Joist strap anchors, galvanized finish.

E. Ledge and Shelf Angles, Channels and Plates Not Attached to Structural Framing: For support of metal decking galvanized finish.

F. Steel Angles at Sectional Door Jambs: Galvanized finish.

G. Enclosure Gates: Welded galvanized tubular steel and decking as detailed, complete with all necessary hardware; prime and site paint finish. Hinges: McMaster-Carr Supply Company, (562) 692-5911, blank hinges, 1/2 inch thick, size and quantity as indicated on the drawings.

H. Site Gates: Tubular steel and perforated metal as detailed, complete with all necessary hardware; prime and site paint finish. Hardware as specified in Section 08 71 00. Perforated Metal: 14 gauge galvanized material with 1/4 inch diameter holes at 60 degrees, staggered 1/2 inch as manufactured by Diamond Manufacturing Company, (800) 233-9601. Powder coated finish. Custom color as selected by the Architect.

I. Awnings and Outriggers: Welded tubular steel and sheet metal as detailed, complete with all necessary hardware; prime and site paint finish.

J. Automatic and Manual Gate Supports: Galvanized tubular steel as detailed; prime and site paint finish.

K. Metal Fence and Gates: Welded tubular steel as detailed, complete with all necessary hardware, prime and site paint finish.

L. Enclosure Covers: Welded galvanized tubular steel and sheet metal roofing as detailed. complete with necessary hardware. Tubular steel: Prime and site paint finish.

M. Reinforcement for Low Partitions: Steel tube shapes as detailed, prime paint finish.

N. Elevator Door Sill Supports: Steel shapes as detailed, prime paint finish.

END OF SECTION

SECTION 05 51 33

METAL LADDERS

1. PART 1 GENERAL

1.1 WORK INCLUDED

A. Prefabricated aluminum roof access ladders.

1.2 REFERENCES

A. AWS D1.2 - Structural Welding Code - Aluminum.

B. OSHA - Standards of Occupational Safety and Health Administration.

C. ANSI - ANSI A-14.3 Standards.

D. ASTM B221 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Submit shop drawings indicating details dimensions, materials, sizes and types of connections, finishes and location within project for each unit.

C. Manufacturer and/or fabricator shall submit a certificate of product compliance with OSHA standards.

1.4 FIELD MEASUREMENTS

A. Verify actual dimensions on site prior to fabrication.

B. Contractor shall be responsible for a complete installation of all components required.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS:

A. O'Keeffe's Inc., www.okeeffes.com.

B. Alaco Aluminum Ladders, www.alacoladder.com.

C. Dur-Red Products, www.dur-red.com.

D. Precision Ladders, LLC, www.precisionladders.com.

E. Substitution: Under provisions of Section 01 25 13.

2.2 MATERIALS

A. Rungs shall be round or square and a minimum of 1-1/8 inch in section, formed from aluminum extrusion, ASTM B221 alloy 6061-T6, and shall be deeply serrated on all sides to provide maximum foot grip and traction. Rungs shall be able to withstand a 250 pound loading without failure. Space rungs 12 inches o.c. as indicated.

B. Channel side rail shall be minimum 3 inch x 1 inch x 1/8 inch aluminum extrusions, ASTM B221 alloy 6061-T6.

C. Welding Materials: AWS D1.2.

D. Finish:

1. Clear natural anodized finish.

2.3 ACCESSORIES

A. Anchorage devices and bolts necessary for installation as required by manufacturer's recommendations.

2.4 FABRICATION

A. Materials used shall be new stock, straight within industry tolerances and free of any defects in finish or structure.

B. Cutting of stock shall be by mechanical means to assure a smooth square and true working edge.

C. Mechanical Connections: Bolted connections shall be made with cast aluminum connectors and stainless steel anchorage devices.

D. Welded Connections: In accordance with AWS D1.2 requirements.

E. Protection of aluminum from dissimilar materials:

1. Dissimilar metals except stainless steel, white bronze, and solid zinc, shall be painted with a heavy brush coat of zinc-chromate primer and one coat of aluminum paint.

2. Aluminum surfaces in contact with mortar, concrete, plaster or other masonry materials shall be given one heavy brush coat of bituminous paint.

3. PART 3 EXECUTION

3.1 PREPARATION

A. Verify proper timing for ladder installation to prevent undue delay in job progress.

B. Installation of ladder units shall be considered as acceptance by the Contractor of the adjacent construction as substantially conforming to the intended details and capability of supporting the ladder unit.

3.2 INSTALLATION:

A. Secure ladders in position as indicated on the Drawings and as required by manufacturer's specifications.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural floor, wall, and roof framing.

B. Built-up structural beams and columns.

C. Floor, wall, and roof sheathing.

D. Plywood underlayment over all wood subfloors.

E. Combination subfloor - underlayment.

F. Wood furring, backing and grounds.

G. Preservative treatment of wood.

H. Fire retardant treatment of wood.

1.2 REFERENCES

A. CBC - California Building Code, (CCR) California Code of Regulations Title 24, Part 2.

B. CBC – California Building Code, CBC Standards, Chapter 23.

C. ALSC - American Lumber Standards Committee: Softwood Lumber Standards.

D. ANSI/AF & PA NDS-12 - National Design Specifications for Wood Construction.

E. ANSI/SDPWS - Special Design Provisions for Wind and Seismic.

F. APA - The Engineered Wood Association.

G. ASTM D6109 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastic Lumber.

H. ASTM E84 - Standard Test Method for Surface burning Characteristics of Building Materials.

I. ASTM E119 – Standard Test Method for Fire Resistance

J. AWPA - American Wood Preservers' Association: Book of Standards.

K. FSC – Forest Stewardship Council.

L. MS MIL-L-19140 - Fire Retardant Wood Preservative Chemicals.

M. National Bureau of Standards - Product Standard PS-1-09 for Construction and Industrial Plywood.

N. WCLIB - West Coast Lumber Inspection Bureau: Standard Grading Rules for West Coast Lumber.

O. WWPA - Western Wood Products Association.

1.3 QUALITY ASSURANCE

A. Lumber Grading Agency: Certified by ALSC.

B. Plywood Grading Agency: Certified by APA.

1.4 REGULATORY REQUIREMENTS

A. Conform to CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Chapter 23.

B. Allowable stress design values shall be in compliance with the CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Section 2306, ANSI/AF & PA NDS-12 - National Design Specifications for Wood Construction, and ANSI/SDPWS - Special Design Provisions for Wind and Seismic.

1.5 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Provide technical data on wood preservative materials and application instructions.

C. In lieu of grade stamping exposed-to-view lumber and plywood, submit manufacturer's certificate under provisions of Section 01 33 00 that products meet or exceed specified requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store and protect products under provisions of Section 01 61 00.

B. Deliver materials free from pest infestation. Protect materials on site to prevent termite, beetle or other wood boring insect attacks.

C. Stack lumber flat, off grade, with spacers between each bundle to promote air circulation. Provide for air circulation around and under coverings.

2. PART 2 PRODUCTS

2.1 LUMBER MATERIALS

A. Lumber Grading Rules: WCLIB and WWPA. Lumber shall bear WCLIB grade stamp.

B. Lumber Materials: FSC – Forest Stewardship Council certified sustainable harvested wood.

C. Beam Framing: Douglas Fir species, Dense No. 1 grade.

D. Joist Framing: Douglas Fir species, No. 1 grade.

E. Rafter Framing: Douglas Fir species, No. 1 grade.

F. Structural Framing, Studs, Plate and Blocking: Douglas Fir Species, No. 1 grade.

G. Non-structural Light Framing Studs, Plate and Blocking: Douglas Fir species, construction grade.

H. Plank and Decking: Douglas Fir species, Com Dex.

2.2 MOISTURE CONTENT

A. 2x and 3x material, 19 percent moisture content, S-Dry. Structural and non structural framing, beam, rafters, joists, studs, plates and blocking.

B. 4x and 6x material, 19 percent moisture content at time of application of Architectural finishes. 22 percent maximum moisture content at time of delivery to project site. Materials to be air dried as required to achieve 22 percent moisture content prior to delivery to site. Structural and non structural framing, beam, rafters, joists, studs, plates and blocking.

C. Lumber materials with a moisture content above 19 percent and less than 22 percent at the time of installation shall be tested for moisture content prior to covering with Architectural finishes. Moisture tests shall be performed under the provisions of Section 01 45 29.

D. No lumber shall be covered with an Architectural finish until the moisture content of the lumber is 19 percent or below.

2.3 PLYWOOD MATERIALS

A. Roof Sheathing: APA Structural I, Grade C-D, Exposure 1 minimum 5-ply construction, meeting product Standard PS-1-09.

B. Wall Sheathing: APA Structural I, Grade C-D, Exposure 1 minimum 5-ply construction, meeting product standard PS-1-09.

C. Fire Retardant Sheathing: Class A, Pressure treated, Grade C-D-X, Fire resistant plywood, 4-ply construction, meeting test standards ASTM E84, ASTM E119, and CBC Standards, Chapter 23.

D. Underlayment: APA Underlayment, Exposure 1, 3/8, 1/4 inch thick, sanded; minimum 3-ply construction.

E. Combination Subfloor - Underlayment: APA rated Sturd-I-Floor, Exposure 1, Exterior Grade 1-1/8 inch thick, T & G edges; sanded.

F. Telephone and Electrical Panel Boards: APA Grade C-D with exterior glue, minimum 5 ply, 3/4 inch thick, meeting PS-1-09.

2.4 ORIENTED STRAND BOARD (OSB)

A. OSB sheathing shall conform to ICC ESR - 2586.

B. Roof Sheathing: APA rated sheathing, Exposure 1, Structural 1, meeting PS-2 and PRP-108 with radiant aluminum foil barrier. Nominal thickness not less than 5/8" inch. Span rating of 32/16.

C. Wall Sheathing: APA rated sheathing, Exposure 1, Structural 1, meeting PS-2 and PRP-108. Nominal thickness not less than 15/32 inch. Span rating of 32/16.

2.5 ACCESSORIES

A. Fasteners: Hot-dipped galvanized steel for exterior, high humidity, and treated wood locations; plain finish elsewhere; size and type to suit condition.

B. Connectors: As indicated.

C. Joist Hangers: Galvanized steel, sized to suit joists and framing conditions; manufactured by Simpson, USP Connectors or KC Metals.

D. Anchors: Thru bolt or anchor bolt to concrete or masonry unless otherwise noted. Bolt for anchorage to steel unless otherwise noted.

E. Building Paper: No. 15 asphalt felt. Plain untreated cellulosic building paper.

2.6 WOOD TREATMENT

A. Preservative Treatment: Where lumber or plywood is indicated as treated or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood).

B. Pressure treat all lumber in contact with ground. After treatment kiln-dry lumber to a maximum moisture content of 19 percent.

C. Pressure treat above ground items as indicated. After treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent. Treat indicated items and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping and similar members in connection with roofing, flashing, vapor barriers and waterproofing.

2. Horizontal wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.

3. Horizontal wood framing members less than 18 inches above grade.

4. Wood floor plates installed over concrete slabs directly in contact with earth.

5. Ends of wood girders entering masonry or concrete walls.

6. Framing members used in exterior door, window, or louver openings.

D. Complete fabrication of treated items prior to treatment, where possible. If cut or drilled after treatment, coat cut or drilled surfaces with heavy brush coat of same chemical used for treatment and to comply with AWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.7 FIRE RETARDANT TREATMENT

A. Fire retardant wood to have a flame spread of less than 25 when tested in an extended 30-minute tunnel test according to ASTM E84.

B. Dimensional lumber to be kiln dried to a maximum moisture content of 19 percent after treatment.

C. Plywood to be kiln dried to a maximum moisture content of 15 percent after treatment.

D. Fire retardant wood to comply with AWPA Standard C20 for lumber and C27 for plywood.

E. Fire retardant chemicals to comply with FR-1 of AWPA Standard P-17 and shall be free of halogens, sulfates and ammonium phosphate.

F. Carbon steel, galvanized steel, aluminum, copper, and red brass in contact with fire retardant wood shall exhibit corrosion rates less than one mil per year when tested in accordance with FS MIL-L-19140, Paragraph 4.6.5.2.

G. Fire retardant chemicals must be registered for use as a wood preservative buy the U.S. Environmental Protection Agency.

H. Fire retardant treat indicated items and the following:

1. Roof sheathing.

2. Wall sheathing.

3. Wood studs, plates and blocking.

4. Wood nailers, curbs, equipment support bases, and similar members in connection with roofing and flashing.

3. PART 3 EXECUTION

3.1 FRAMING

A. Erect wood framing members level and plumb.

B. Place horizontal members laid flat, crown side-up.

C. Construct framing members full length without splices.

D. Double members at openings over 1 sq ft. Space short studs over and under opening to stud spacing.

E. Construct double joist headers at floor and ceiling openings. Frame rigidly into joists.

F. Construct double joists under wall studding.

G. Bridge joists in excess of 8 feet span at mid-span members. Fit solid blocking at ends of members.

H. Coordinate installation of wood chord metal joists, glue laminated structural units, plywood web joists.

3.2 FURRING, BLOCKING AND GROUNDS

A. Provide wherever shown and where required for attachment of other work. Coordinate with work of other sections.

B. Item locations include but are not limited to toilet accessories, toilet partitions, door frames, window frames, hardware, access doors and ladders, cabinetry, miscellaneous equipment locations and mechanical, plumbing and electrical item locations and all other locations of wall mounted items.

C. Install plywood backboards for telephone, data and other electrical equipment.

D. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

E. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated.

F. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

G. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finished work.

H. Firestop all concealed spaces of wood stud walls, ceilings and floor levels at 10 foot intervals both vertically and horizontally.

I. Firestop all concealed vertical and horizontal spaces as occur at soffits, vents, stair stringers, pipes and similar openings in compliance with CBC, (CCR) Title 24, Part 2, Section 718.

J. Firestopping shall consist of closely fitted wood blocks of 2 inch nominal thickness lumber of same width as framing members.

3.3 SHEATHING

A. Secure roof sheathing perpendicular to framing members with ends staggered. Secure sheet edges over firm bearing. Provide solid edge blocking between sheets. Space panels 1/8 inch apart at ends and edges. Install radiant barrier towards interior of roof.

B. Secure wall sheathing perpendicular to wall studs, with ends staggered, over firm bearing.

C. Secure subfloor, combination subfloor-underlayment perpendicular to floor framing with end joints staggered. Secure sheet edges over firm bearing. Attach sheathing with subfloor glue and screws. Space panels 1/8 inch apart at ends and edges.

D. Place building paper between underlayment and subflooring.

E. Secure flooring underlayment with screws. Install after dust and dirt generating activities have ceased and prior to application of finished flooring. Apply perpendicular to subflooring. Stagger end joints of underlayment. Space panels 1/32 inch apart at ends and edges.

F. Install telephone and electrical panel back boards where required. Size of backboards to be 12 inches beyond size of electrical panel boards.

3.4 RECYCLING CONSTRUCTION WASTE

A. Recycle lumber waste under the provisions of Section 01 74 19.

3.5 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 29.

B. Lumber materials will be inspected for compliance with material grading rules, limitations for moisture content and pest infestation prior to any materials being concealed from view or being covered with an architectural finish.

3.6 TOLERANCES

A. Framing Members: 1/4 inch maximum from true position.

B. Surface Flatness of Floor: 1/4 inch in 10 feet maximum.

END OF SECTION

SECTION 06 17 33

WOOD I-JOISTS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wood chord and wood web joists for roof framing.

B. Bridging, bracing, and anchorage.

C. Framing for openings.

1.2 REFERENCES

A. ALSC - American Lumber Standards Committee: Softwood Lumber Standards.

B. APA - The Engineered Wood Association.

C. ASTM D2559 - Adhesives for Structural Laminated Wood Products for use Under Exterior Exposure Conditions.

D. ASTM D5055 - Standard Specification for Establishing and Monitoring Capabilities of Pre-Fabricated Wood I - Joists.

E. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

F. FSC - Forest Stewardship Council.

G. ICC - (International Code Council) Evaluation Service, Inc.

H. National Bureau of Standards - Product Standard PS-1-95 for Construction and Industrial Plywood.

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacture of plywood web joists with five years minimum experience.

B. Design joists under direct supervision of a Civil or Structural Engineer experienced in structural framing design registered in State of California. Where joists support mechanical equipment, include weight in joist design.

C. Perform work in accordance with the following agencies:

1. Lumber grading agency: Certified by ALSC.

2. Plywood grading agency: Certified by APA.

D. Wood products shall be FSC Certified according to the rules of the Forest Stewardship Council. www.fscus.org.

E. Accredited certification bodies shall be one of the following:

1. Rainforest Alliance, www.rainforest-alliance.org.

2. SCS Global Services, www.scsglobalservices.com.

1.4 REGULATORY REQUIREMENTS

A. Conform to CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, for loads, seismic zoning, and other governing criteria.

B. Conform to ICC/ES Report from manufacturer for fire and sound ratings indicated.

1.5 SUBMITTALS

A. Submit shop drawings under provisions of Section 01 33 00.

B. Indicate framing system, sizes and spacing of joists, loads and joist cambers, bearing and anchor details, bridging and bracing, and framed openings.

C. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

1.6 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit certified wood product certificates under the provisions of Section 01 81 13.

B. Submit certified wood product evidence from vendor in the form of an invoice that contains Chain of Custody number and identification of each FSC-certified product on a line-item basis.

C. LEED Submittal: Submit manufacturer's product data under the provisions of Section 01 81 13 for composite wood products indicating that bonding agent used contains no urea formaldehyde.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products to site under provisions of Section 01 61 00.

B. Transport and store joists in vertical position resting on bearing ends.

C. Protect joists from moisture, warpage, and distortion during transit and when site stored.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Boise Cascade Engineered Wood Products, BCI Joists, ICC/ES No. ESR-1336, www.engsupport.bc.com

B. Red Built, Inc., Red-I Joist, ICC/ES No. 2994, www.redbuilt.com

C. Weyerhauser, iLevel, TJI Series, ICC No. ESR1153, www.ilevel.com.

2.2 MATERIALS

A. Lumber Materials: FSC - Forest Stewardship Council certified sustainable harvested wood.

B. Lumber Grading Rules: ALSC.

C. Wood Chord Members: Top and bottom chord members shall be microllam laminated veneer lumber (LVL) NER-481.

D. Plywood Web: APA rated, Structural 1, meeting product standard PS-1-95.

E. Composite Web: 7/16 inch thick Performance Plus OSB conforming to PS2-92, Exposure 1.

F. Joist Bridging: Type, size and spacing as indicated on the drawings.

2.3 ACCESSORIES

A. Provide all web stiffeners, blocking panels, connections, etc., as required for a complete installation.

B. Fasteners: Galvanized steel, type to suit application.

C. Glue: ASTM D2559; For wet condition of service.

D. Joist hangers and hardware shall be as indicated.

2.4 FABRICATION

A. Fabricate joists to achieve structural requirements specified.

B. Verify dimensions and site conditions prior to fabrication.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify that supports and openings are ready to receive joists.

B. Verify sufficient end bearing area.

C. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Coordinate placement of bearing items.

3.3 INSTALLATION

A. Install joists in accordance with manufacturer's instructions.

B. Place joists true to line and level.

C. Provide temporary bracing to position joists in place until permanently secured.

D. Place permanent bridging, bracing, and anchors to maintain joists straight and in correct position before installation of decking or inducing loads.

E. Place headers and supports to frame openings required.

F. Frame openings between joists with lumber in accordance with Section 06 10 00.

G. Coordinate placement of decking with work of this Section.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 29.

3.5 TOLERANCES

A. Framing Members: 1/2 inch maximum from true position.

3.6 RECYCLING CONSTRUCTION WASTE

A. Recycle lumber waste under the provisions of Section 01 74 19.

END OF SECTION

SECTION 06 18 00

GLUED-LAMINATED CONSTRUCTION

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glued-Laminated structural wood elements.

B. Preservative treatment of wood.

C. Steel hardware and attachment brackets.

1.2 REFERENCES

A. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

B. AITC - American Institute of Timber Construction.

C. ALSC - American Lumber Standards Committee: Softwood Lumber Standards.

D. ASTM A36 - Structural Steel.

E. ASTM A123 - Zinc (Hot Galvanized) coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.

F. ASTM A167 - Stainless and Heat Resisting Chromium Nickel Steel Plate, Sheet, and Strip.

G. ASTM A307 - Carbon Steel Bolts and Studs.

H. ASTM D2559 - Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions.

I. ASTM D3737 - Establishing Allowable Properties for Structural Glued Laminated Timber (Glulam).

J. AWPA - American Wood Preservers' Association.

K. FSC - Forest Stewardship Council.

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacture of glued-laminated structural units with three years minimum experience and certified by the AITC.

B. Glued-Laminated Timber Structural Capacities: Determined in accordance with ASTM D3737.

C. Wood products shall be FSC Certified according to the rules of the Forest Stewardship Council. www.fscus.org.

D. Accredited certification bodies shall be one of the following:

1. Rainforest Alliance, www.rainforest-alliance.org.

2. SCS Global Services, www.scsglobalservices.com.

1.4 REGULATORY REQUIREMENTS

A. Conform to CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, for loads, seismic zoning, and other load criteria.

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00.

B. Indicate framing system, sizes and spacing of members, loads and cambers, bearing and anchor details, bridging and bracing, framed openings.

C. Provide technical data on wood preservative materials, application technique, and resultant performance information.

1.6 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit certified wood product certificates under the provisions of Section 01 81 13.

B. Submit certified wood product evidence from vendor in the form of an invoice that contains Chain of Custody number and identification of each FSC-certified product on a line-item basis.

C. LEED Submittal: Submit manufacturer's product data under the provisions of Section 01 81 13 for composite wood products indicating that bonding agent used contains no urea formaldehyde.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products under provisions of Section 01 61 00.

B. Protect members in accordance with AITC requirements for individually wrapped material.

C. Leave individual wrapping in place until finishing occurs.

2. PART 2 PRODUCTS

2.1 MATERIALS

A. Lumber: Douglas Fir, (all heart) lumber conforming to AITC A190.1 grading rules. Design for the following values:

Bending (Fb)	:	2400 psi.
Tension Parallel to Grain (Ft)	:	1150 psi.
Compression Parallel to Grain (Fc)	:	1650 psi.
Compression Perpendicular to Grain Bottom (Fcl)	:	650 psi.
Compression Perpendicular to Grain Top (Fcl)	:	650 psi.
Horizontal Shear (Fv)	:	165 psi.
Modulus of Elasticity (E)	:	1.8×10^6 psi.

B. Lumber Materials: FSC – Forest Stewardship Council certified sustainable harvested wood.

C. Steel Connections and Brackets: ASTM A36; weldable quality, hot-dip galvanized according to ASTM A123 to 1.25 oz/sq ft.

D. Steel Connections and Brackets: ASTM A167 Type 304 stainless steel.

E. Hardware: ASTM A307, structural quality steel; hot dip galvanized according to ASTM A123 to 1.25 oz/sq ft.

F. Anchor Bolts: ASTM A307 galvanized steel.

G. Adhesive: ASTM D2559; For wet condition of service.

H. Sealer: Manufacturer's standard translucent penetrative wood sealer, which will not interfere with application of wood stain and transparent finish, or paint finish as indicated.

2.2 WOOD TREATMENT

A. Preservative Treatment: Where preservative treatment is indicated, pressure treat lumber prior to gluing, in accordance with AWPA U1, [Category 3A] [Category 3B]. Kiln dry to not more than 15 percent moisture content after treatment. Discard pieces which have bowed, warped, twisted or checked to extent of causing detrimental results in work.

B. Where preservative treated members are cut or drilled, apply a field-treatment preservative in accordance with AWPA M4.

C. Use preservative solution without water repellent substances that might interfere with application of indicated finishes.

2.3 FABRICATION

A. Fabricate glued-laminated structural members in accordance with CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Section 2303.1.3 and 2306.

B. Fabricate glued-laminated structural members in accordance with AITC industrial grade.

C. Verify dimensions and site conditions prior to fabrication.

D. Cut and fit members accurately to length to achieve tight joint fit.

E. Fabricate member with camber built in.

F. Do not splice or join members in locations other than that indicated, without permission.

G. Fabricate steel hardware and connections with joints neatly fitted, welded, and ground smooth.

H. After end trimming, and end-coat sealing, apply a heavy saturation coat of penetrating sealer in accordance with AITC requirements except where preservative treatment has been applied.

2.4 FINISHES

A. Galvanized connectors in accordance with ASTM A123.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify that supports are ready to receive beams.

B. Verify sufficient end bearing area.

C. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Coordinate placement of bearing items.

3.3 ERECTION

A. Set structural members level and plumb, in correct positions.

B. Provide temporary bracing and anchorage to hold members in place until permanently secured.

C. Fit members together accurately without trimming, cutting, or any other unauthorized modification.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 29.

3.5 RECYCLING CONSTRUCTION WASTE

A. Recycle lumber waste under the provisions of Section 01 74 19.

3.6 TOLERANCES

A. Framing Members: 1/2 inch maximum from true position.

END OF SECTION

SECTION 06 20 00

FINISH CARPENTRY

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Finish carpentry items, other than shop prefabricated casework.

B. Hardware and attachment accessories.

1.2 REFERENCES

A. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

B. AWPA - American Wood Preservers Association.

C. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

D. UL - Underwriters' Laboratories, Inc.

E. WI - Woodwork Institute: North American Architectural Woodwork Standards 3.0.

1.3 QUALITY ASSURANCE

A. Manufacture millwork and finish carpentry items in accordance with quality standards of the North American Architectural Woodwork Standards of the Woodwork Institute.

B. All millwork and the installation of millwork shall be monitored for compliance under the scope of the WI Monitored Compliance Program (MCP).

C. Fees charged by the Woodwork Institute for their monitored compliance service are the responsibility of the millwork manufacturer.

D. Provide WI Certified Compliance Labels on all items of millwork.

E. Provide WI Inspection Service at the job site prior to installation. Provide to Architect a written report showing results of the reinspection.

F. Upon completion of the installation, provide a WI Monitored Compliance Certificate.

G. Wood products shall be FSC Certified according to the rules of the Forest Stewardship Council. www.fscus.org.

H. Accredited certification bodies shall be one of the following:

1. Rainforest Alliance, www.rainforest-alliance.org.

2. SCS Global Services, www.scsglobalservices.com.

1.4 REGULATORY REQUIREMENTS

A. Conform to CBC and UL requirements for fire ratings.

B. Conform to Flame Spread Classifications of Interior Millwork for flame spread ratings as tested according to ASTM E84.

1.5 SUBMITTALS

A. Submit shop drawings under provisions of Section 01 33 00.

B. Indicate materials, component profiles, fastening methods, jointing details, finishes, and accessories to a minimum scale of 1-1/2 inch to one foot. Provide WI Certified Compliance label on first page of each set.

C. Submit samples under provisions of Section 01 33 00.

D. Submit two samples 6 x 12 inch in size illustrating wood grain, species, and specified finish.

E. Submit two samples 18 inch long of wood trim.

1.6 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit certified wood product certificates under the provisions of Section 01 81 13.

B. Submit certified wood product evidence from vendor in the form of an invoice that contains Chain of Custody number and identification of each FSC-certified product on a line-item basis.

C. LEED Submittal: Submit manufacturer's product data under the provisions of Section 01 81 13 for composite wood products indicating that bonding agent used contains no urea formaldehyde.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products under provisions of Section 01 61 00.

B. For interior applications conform to Section 2 of the North American Architectural Woodwork Standards for a climate controlled application.

C. Store materials in ventilated, interior locations under constant minimum temperatures of 60 degrees F and maximum relative humidity of 25 to 55 percent.

2. PART 2 PRODUCTS

2.1 FABRICATORS

A. Active member of the Woodwork Institute, licensed by WI to provide the WI certified Compliance Certificates and Labels for the products and materials specified in this section, www.woodworkinstitute.com.

B. Substitutions: Under provisions of Section 01 25 13.

2.2 MATERIALS

A. Materials specified under the North American Architectural Woodwork Standards Section Numbers refer to lumber grades as follows: Section 3, Lumber - Hardwood/Softwoods; Section 4, Plywood - Hardwood/Softwood; Section 6, Exterior Trim; and Interior Trim; Section 7, Stair Work and Rails.

B. Materials: FSC - Forest Stewardship Council certified sustainable harvested wood.

2.3 EXTERIOR TRIM

A. Fabricate in accordance with Section 6 of the North American Architectural Woodwork Standards.

Item	Species	Grade	Intended Finish
	Cedar,Western Red	Custom	Opaque

Item	Species	Grade	Intended Finish
Exterior Wood Trim Fascias & Rakes			
Tongue and Groove Soffit	Cedar, Western Red	Custom	Opaque

2.4 MISCELLANEOUS EXTERIOR MILLWORK

A. Fabricate in accordance with Section 6 of the North American Architectural Woodwork Standards.

2.5 INTERIOR TRIM

A. Fabricate in accordance with Section 6 of the North American Architectural Woodwork Standards.

Item	Species	Grade	Intended Finish
Window Trim	Maple	Custom	Transparent
Bed Edge Trim, Wall Niche	Maple	Custom	Transparent

2.6 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: 0.028 inch minimum thickness, color selected by Architect; manufactured by Formica.

B. Plastic Laminate Backing: High pressure paper base laminate without a decorative finish; 0.020 inch thick.

2.7 ADHESIVE

A. Adhesives: Type 1 adhesive recommended by WI to accommodate application in accordance with the Appendix A to the North American Architectural Woodwork Standards.

B. Formulation: Exterior type per AWPA C20, consisting of organic-resin solution, insoluble in water, thermally set in wood by kiln drying.

C. Wall Adhesive: Solvent release, cartridge type, compatible with wall substrate, capable of achieving durable bond.

2.8 ACCESSORIES

A. Nails: Size and type to suit application, galvanized finish for interior use, stainless steel for exterior use.

B. Bolts, Nuts, Washers, Blind Fasteners, Lags, and Screws: Size and type to suit application; galvanized finish for interior use, stainless steel for exterior use.

C. Lumber for Shimming and Blocking: Softwood lumber of Douglas Fir species.

D. Primer: Alkyd primer sealer.
E. Wood Filler: Solvent base, tinted to match surface finish color.

2.9 FABRICATION

A. Fabricate work in accordance with WI Premium grade standards.

B. Shop assemble work for delivery to site, permitting passage through building openings.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

A. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.

B. Cap exposed plastic laminate finish edges with material of same finish and pattern and 1/2 inch aluminum wall reveal as indicated on drawings. Color as selected by Architect.

C. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and openings are ready to receive work and field measurements are as instructed by the fabricator.

B. Verify mechanical, electrical, and building items affecting work of this Section are placed and ready to receive this work.

C. Verify adequacy of backing and support framing.

D. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials or that will be permanently concealed from view.

3.3 INSTALLATION

A. Install work in accordance with the WI North American Architectural Woodwork Standards Premium quality standard.

3.4 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

3.5 PREPARATION FOR FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

3.6 FINISHING

A. Site finish under provisions of Section 09 90 00.

3.7 PROTECTION

A. Protect finished installation under provisions of Section 01 61 00.

END OF SECTION

SECTION 06 41 16

PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Special fabricated cabinet units.

B. Countertops.

C. Preparation for utilities.

D. Cabinet hardware.

1.2 REFERENCES

A. WI - Woodwork Institute of California: North American Architectural Woodwork Standards 3.1. (NAAWS)

B. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

C. CBC – California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

1.3 QUALITY ASSURANCE - MONITORED COMPLIANCE PROGRAM

A. Manufacture casework items in accordance with quality standards of the North American Architectural Woodwork Standards of the Woodwork Institute.

B. All millwork and the installation of millwork shall be monitored for compliance under the scope of the WI Monitored Compliance Program (MCP).

C. Fees charged by the Woodwork Institute for their monitored compliance service are the responsibility of the casework manufacturer.

D. Provide WI Inspection Service at the millwork fabricator. Provide to Architect a written report showing the results of the inspection.

E. Provide WI Certified Compliance Labels on all items of casework and countertops.

F. Provide WI Inspection Service at the job site. Provide to Architect a written report showing the results of the inspection.

G. Self Certification by the millwork fabricator or inspection by other than an authorized representative of The Woodwork Institute is not acceptable.

H. Upon completion of the installation, provide a WI Monitored Compliance Certificate.

1.4 QUALITY ASSURANCE - CERTIFIED SEISMIC INSTALLATION PROGRAM

A. Install casework items in accordance with the Woodwork Institute's Certified Seismic Installation Program (CSIP).

B. Prior to walls being closed up and covered, provide a written Woodwork Institute Certified Seismic Installation report confirming that backing is provided in all locations required for casework installation. Identify those areas where backing is missing or improperly located.

C. On completion of installation of casework provide a Woodwork Institute Certified Seismic Installation Program Certificate. Identify the work covered and certify that the work as installed is in compliance with the requirements of the Woodwork Institute's Certified Seismic Installation Program (CSIP).

D. Fees charged by the Woodwork Institute for monitoring and compliance for their Certified Seismic Installation Program (CSIP) are the responsibility of the casework manufacturer and installer.

1.5 QUALITY ASSURANCE

A. Wood products shall be FSC Certified according to the rules of the Forest Stewardship Council. www.fscus.org.

B. Accredited certification bodies shall be one of the following:

1. Rainforest Alliance, www.rainforest-alliance.org.

2. SCS Global Services, www.scsglobalservices.com.

1.6 REGULATORY REQUIREMENTS

A. Conform to CBC requirements for flame spread classification in accordance with CBC Section 803 and Table 803.11.

B. Conform to Flame Spread Classifications for Interior Millwork for flame spread ratings as tested according to ASTM E84.

C. Materials of this section shall meet the requirements for formaldehyde as specified in the California Air Resources Board's Air Toxics Control Measure (ATCM) for Composite Wood (17CCR 93120 et seq.).

D. Operable parts for all accessible casework shall comply with CBC Section 11B-309.

1.7 MOCKUP

A. Prepare mockup under provisions of Section 01 43 00.

B. Provide full size base cabinet and upper cabinet of each type indicated, in specified finish with hardware installed.

C. Units will be examined to ascertain quality and conformity to WI standards.

D. Units will establish a minimum standard of quality for this work.

E. Approved units may be used as part of the Work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and protect products to site under provisions of Section 01 61 00.

B. Conform to Section 2 of the North American Architectural Woodwork Standards for a climate controlled application.

C. Delivery of casework shall be made only when the area of installation is enclosed, all plaster and concrete work is dry, the area is broom clean and environmental conditions are as specified.

1.9 ENVIRONMENTAL CONDITIONS

A. Area of casework installation shall be fully enclosed, well ventilated, and protected from direct sunlight, excessive heat, rain and moisture.

B. Relative humidity of the area of casework installation shall be maintained between 25 percent and 55 percent with a temperature range of between 60 degrees F to 90 degrees F.

C. Casework shall be acclimated to the area of installation for a minimum of 72 hours prior to installation.

1.10 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00.

B. Include materials, component profiles, fastening methods, assembly methods, joint details, accessory listings, schedule of finishes and keying plan.

C. Provide WI Certified Compliance Label for the Certified Seismic Installation Program on the first page of shop drawings.

D. Provide WI Certified Compliance label on first page of shop drawings. Include WI inspector's signature.

E. Provide WI certificates of compliance and inspection reports.

1.11 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit manufacturer’s product data under the provisions of Section 01 81 13 for composite wood products indicating that bonding agent used contains no urea formaldehyde.

B. LEED Submittal: Submit certified wood product certificates under provisions of Section 01 81 13.

C. Submit certified wood product evidence from vendor in the form of an invoice that contains Chain of Custody number and identification of each FSC-certified product on a line-item basis.

1.12 WARRANTY

A. Provide manufacturer's 10 year warranty for solid surface countertops under provisions of Section 01 77 00.

B. Warranty to provide for repair or replacement of countertop material if material fails due to manufacturing defect.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Active member of the Woodwork Institute licensed by WI to provide WI Certified Compliance Certificates and Labels for the products and materials specified in this section www.woodworkinstitute.com.

B. Substitutions: Under provisions of Section 01 25 13.

2.2 MATERIALS

A. Material shall conform to standards of the North American Architectural Woodwork Standards as follows: Section 3, Section 4, Section 10, and Section 11.

B. Materials: FSC - Forest Stewardship Council certified sustainable harvested wood.

2.3 CABINET DESIGN

A. Individual cabinets are indicated on the drawings by the WI Cabinet Design Series (CDS) numbering system, Design Ideas.

2.1 MODULAR CASEWORK - LAMINATED PLASTIC COVERED

A. Fabricate in accordance with Section 10 of the North American Architectural Woodwork Standards.

WI Grade:	Premium
Core Material:	Combination Core, PureBond Classic Core, www.columbiaforestproducts.com or Pro-Core, www.timberproducts.com.
Construction:	Style - Frameless
Joinery:	Doweled Joints.
Cabinet Backs:	Blind Dadoed.
Cabinet Door Type:	Flush overlay.
Base:	Moisture resistant.
Shelves:	1-M-2 particle board, with HPDL two sides, 1 inch thick, MOE of 710,000, capable of supporting 50 lb/sq ft load with deflection of L/144.

Shelf Edge Bands	0.028 inch high pressure plastic laminate in color to match shelf. All 4 edges of adjustable shelves to receive banding.
Door and Drawer Edge Bands:	0.028 inch high pressure plastic laminate the same as exposed faces.
Exposed Surfaces (Including shelves and interior of open front cabinets):	0.028 inch high pressure plastic laminate, color and pattern as selected by Architect. A maximum of 5 colors and patterns to be selected. A minimum of 3 color combinations per room may be selected.
Semi-Exposed Surfaces (Behind doors and inside drawers):	Low pressure decorative polyester or melamine laminate 0.020 inch thick in complimentary color to exposed surfaces as selected.
Security and Dust Panels:	Particle board, 3/4 inch thick at all lockable drawers.

2.2 MODULAR CASEWORK - SOLID COMPOSITE CONSTRUCTION

A. Fabricate in accordance with Section 10 of the Architectural Woodwork Standards.

1. Material: “Compact” by Formica, ½ inch thick.

2. WI Grade Premium.

3. Type: Type I.

4. Cabinet Door Type: Type I.

5. Construction: Style A - Frameless. Fabricated entire cabinet of solid composite material.

6. Colors and Pattern: To be selected by Architect from manufacturer’s complete range. A maximum of 10 colors and patterns to be selected for use in varying amounts at all solid composite locations.

2.3 LAMINATED PLASTIC COUNTERTOPS

A. Fabricate in accordance with Section 11 of the North American Architectural Woodwork Standards.

WI Grade:	Premium.
Core Thickness:	0.75 inch minimum.
Laminate Thickness:	0.050 inch or .042 inch for postformed use.
Front Edge Covering:	Self-edged.
Backsplash at Top:	Integral Coved. 4 inch height unless noted otherwise.
Top of Back Splash:	Square with scribe.
Construction Type:	Assembly 2, deck mount, manufacturer assembled.

Plastic Colors and Pattern:	To be selected from the complete range of the Formica Laminate Series. A maximum of five (5) colors and patterns to be selected for use in varying amounts at all plastic laminate countertop locations.

2.4 STAINLESS STEEL COUNTERTOPS

A. Stainless Steel: ASTM A167, Type 304, No. 4 finish, 0.050 inch thick.

B. Core: Particleboard, minimum 3/4 inch thick.

C. Edge: Marine edge, 1-1/2 inch total thickness.

D. Backsplash: Integral cove with chamfered top edge 1-1/2 inch total thickness. 4 inch height.

E. Seams: Continuous welded seams. Grind smooth.

2.5 SOLID POLYMER COUNTERTOPS

A. Manufacturers:

1. Avonite, Inc., Product: Avonite, www.avonite.com.

2. Diamond Surfaces USA, Product: Solid Surface, www.diamondsurfaces.com.

3. Corian by DuPont, Product: Corian, www.corian.com.

4. Formica Corporation, Product: Solid Surfacing, www.formica.com.

5. WilsonArt, Product: Earthstone/Gibraltor, www.wilsonart.com.

6. Substitutions: Under provisions of Section 01 25 13.

B. Fabricate solid polymer tops and splashes in accordance with the following:

Top Thickness	:	0.50 inch
Edge Detail	:	1.50 inch thick; Square edge.
Backsplash	:	0.75 inch thick; Square butt. 4 inch height U.N.O
Top of Backsplash	:	Eased.
Color	:	To be selected from manufacturer's entire range of solid and textured colors.

2.6 QUARTZ SURFACE COUNTERTOPS

A. Manufacturer:

1. Caesar Stone, www.caesarstone.com.

2. Cambria, www.cambriaUSA.com.

3. Corian Quartz by DuPont, www.corianquartz.com.

4. Radianz, www.staron.com.

5. Substitutions: Under provisions of Section 01 25 13.

B. Quartz surface tops and splashes shall be fabricated from 93 percent crushed quartz aggregate.

C. Finish: Polished.

D. Nominal Thickness: 3/4 inch.

E. Edge Detail: 1-1/2 inch thick laminated bullnose.

F. Splashes: 3/4 inch thick backsplashes and end splashes. 4 inch height. Straight butt joint, slightly eased at edges.

G. Joints: Fabricate countertop without joints.

H. Cutouts: Form cutouts in shop to smooth, even curves.

I. Fittings: Drill countertop in shop for plumbing fittings and similar items.

J. Color: To be selected from manufacturer’s full range of colors.

2.7 HARDWARE

A. Finish: Stainless Steel.

B. Shelf Supports: Metal or molded polycarbonate clips set in drilled holes spaced 32 mm on center. Clips to have vertical locating pin for retention of shelf.

C. Drawer and Door Pulls: Epco Epco BP128-SS Bar Pull.

D. Cabinet Locks: CompXNational Keyless Combination Cam Locks.

E. Drawer Slides for Drawers 24 inch Wide or Less: Accuride 7432.

F. Drawer Slides for Drawers over 24 inch Wide: Accuride 3640.

G. Drawer slides for File Drawers: Accuride 4034.

H. Hinges: Hafele, Aximat hinge. Use Aximat 300 thin panel hinge for solid composite cabinets. Hinges per leaf: 3'-0" high doors - 2 hinges, 3'-0" to 5'-0" high doors -3 hinges, 5'-0" to 7'-4" high doors - 4 hinges, 7'-0" to 8'-0" - 5 hinges.

I. Magnetic Door Catch: Epco 591/592.

J. Sliding Door Track Assemblies: Grant 2023N sheaves and Grant 2011 track.

K. Grommets: Doug Mockett and Company, Inc., www.mockett.com. EDP3 Series; plastic 2-1/2 inch diameter, 30 required. LO Series; plastic 6 x 3 inch 4 required. Colors as selected by Architect.

L. Hanger Rods: Knape and Vogt 770 with 760 end flanges.

M. Countertop Support Bracket: Model C-18/C-24 as manufactured by A & M Hardware, Inc., www.aandmhardware.com.

N. Wall Cabinet Pullout: Rev-A-Shelf, www.rev-a-shelf.com, Model: Field verify to ensure fit. One (1) assembly required in Room 116.

O. Sink Front tip-Out Tray with Hinges: Rev-A-Shelf, www.rev-a-shelf.com. Each assembly contains on Model: 6581 series stainless steel tray and one pair of LD-0220-45SC Soft-Close Tip-Out Hinge. Width to fit the sink front false panels. Two (2) assemblies required in Rooms 116 and 135.

P. Remainder of hardware required shall meet requirements of ANSI/BHMA Grade 1.

Q. Plumbing and electrical service fixtures as indicated in Division 22 and Division 26.

R. Substitutions: Under the provisions of Section 01 25 13.

2.8 FABRICATION

A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

C. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges.

D. Before installation, seal unfinished material installed for backs, bases, self-edge backing, stripping and other concealed portions with a water-repellant sealer.

E. Provide all supports and required inserts for below countertop type sink units.

F. Install plastic grommets in the field in plastic laminate casework and Owner furnished furniture as directed by the Owner's Representative and/or Architect.

G. Install one adjustable shelf for each 1'-0" of height for all wall mounted cabinets.

H. Provide stretcher at top face of all door and drawer fronts.

I. Provide locks as indicated on the schedule..

2.9 RESTORATION AND SURFACE PREPARATION OF EXISTING CABINETS

A. Only skilled workers who are experienced in cabinetry repairs and restoration, have the skills required for the work of this section, and are familiar with the materials and methods required for laminate-clad wood cabinet restoration work shall be used.

B. In the acceptance or rejection of the restoration work, no allowance will be made for lack of skill on the part of the workers or their lack of experience.

C. Coordinate restoration of existing surfaces so that they are exposed for a minimal amount of time prior to refinishing to avoid further damage to bare wood.

D. Protect all adjacent surfaces from damage or deterioration resulting from restoration work.

E. Protect restoration work in progress to prevent further deterioration of exposed surfaces.

F. Remove and relocate existing cabinetry to new locations as indicated. Provide additional scribe strips as needed for adjacent cabinetry or abutting walls.

G. Adjust height of toe space as required to conform to designated height of countertop.

H. Remove all decayed laminate-clad cabinetry to a clean, sound unaffected substrate.

I. Remove plastic laminate cladding on face frames and end panels of cabinetry.

J. All peeling and loose plastic laminate shall be removed.

K. Wash all surfaces with recommended neutralizing agents to remove any foreign particles and chemical residue.

L. Remove existing hardware and fill all holes with repair compound. Sand surface even and smooth.

M. Relaminate face frames and end panels with plastic laminate.

N. Install new hardware. Installation to include hinges, pulls, locks, and drawer slides. Adjust for proper operation.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify adequacy of backing and support framing.

3.2 INSTALLATION

A. Set and secure casework in place rigid, plumb, and level.

B. Install casework in accordance with Section 10 of the North American Architectural Woodwork Standards.

C. Install casework items in accordance with the Woodwork Institute's Certified Seismic Installation Program (CSIP)

D. Install countertops in accordance with Section 11 of the North American Architectural Woodwork Standards.

3.3 ADJUSTING AND CLEANING

A. Adjust doors, drawers, hardware, fixtures and other moving or operating parts to function smoothly and correctly.

B. Clean casework, counters, shelves, hardware, fittings and fixtures.

3.4 SCHEDULE

A. As indicated on the drawings.

END OF SECTION

SECTION 07 13 53

ELASTOMERIC SHEET WATERPROOFING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Below grade membrane waterproofing.

B. Application Schedule.

1.2 REFERENCES

A. ASTM C578 - Preformed, Cellular Polystyrene Thermal Insulation.

B. ASTM D412 - Rubber Properties in Tension.

C. ASTM D570 - Method for Water Absorption of Plastics.

D. ASTM D1970 - Specification for Self Adhering Polymer Modified Bituminous Sheet Materials.

E. ASTM E96 - Water Vapor Transmission of Materials in Sheet Form.

F. ASTM E154 - Water Vapor Retarders Used in Contact with Earth, Under Concrete Slabs, on Walls, or as Ground Cover.

1.3 SYSTEM DESCRIPTION

A. Waterproofing System: Sheet membrane capable of resisting water head of 200 feet and preventing moisture migration to interior.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Submit samples under provisions of Section 01 33 00.

C. Submit two samples 6 x 6 inches in size of sheet membrane.

D. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

E. Submit manufacturer's inspection reports under provisions of Section 01 33 00.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with manufacturer's recommendations.

B. Maintain one copy of document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of products specified in this Section with minimum five years documented experience.

B. Applicator: Company specializing in applying the work of this Section with minimum three years documented experience and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products to site under provisions of Section 01 61 00.

1.8 REGULATORY REQUIREMENTS

A. Comply with all current federal, state, and local volatile organic compound (VOC) regulations.

B. Do not use solvent based primers containing 1-1-1 trichloroethane or asphalt emulsions.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not apply products when surface or ambient temperature is below 25 degrees F.

B. Do not apply to damp or frozen surfaces or during inclement weather.

1.10 SEQUENCING AND SCHEDULING

A. Coordinate work under the provisions of Section 01 31 00.

1.11 WARRANTY

A. Provide 5 year warranty under provisions of Section 01 77 00.

B. Furnish manufacturer's warranty that materials will be free of defects in manufacture.

C. Furnish applicator's warranty that the installation of materials will provide a leak free system.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS

A. GCP Applied Technologies; Product - Bituthene System 3000, www.gcpat.com.

B. Pecora Corporation; Product - Duramem 700-SM, www.pecora.com.

C. Carlisle Inc; Product - CCW Miradri 860, www.carlisleccw.com.

D. Polyguard Products, Inc.; Product-Polyguard 650, www.polyguardproducts.com.

E. W.R. Meadows, Inc.; Product - Mel-Rol., www.wrmeadows.com.

F. Tamko Products, Inc.; Product-TW-60, www.tamko.com.

G. Substitutions: Under provisions of Section 01 25 13.

2.2 MEMBRANE MATERIALS

A. Self-adhesive, cold-applied waterproofing sheet membrane consisting of a cross-laminated polyethylene film and rubberized asphalt of a thickness of .060 inches (60 mils) by 36 inch wide rolls, inter-wound with a disposable silicone-coated release sheet; conforming to the following:

Properties	Test	Results
Pliability, 180 degrees bend over 1 inch mandrel at - 45 degrees F	ASTM D1970	Unaffected
Tensile Strength (membrane)	ASTM D412	250 psi
Tensile Strength (film)	ASTM D412	5000 psi
Elongation	ASTM D412	300 percent
Puncture Resistance (membrane)	ASTM E154	40 lb
Permeance	ASTM E96 (Method B)	0.05 grains/sq. ft./ hr./in Hg
Water Absorption	ASTM D570	0.1 percent

2.3 ACCESSORIES

A. Surface Conditioner: Acrylic latex diluted with water.

B. Mastic: Rubberized asphaltic type recommended by membrane manufacturer.

C. Liquid Membrane: Two component elastomeric, mastic grade.

D. Cement Mortar: Epoxy or latex modified cementitious composition acceptable to membrane manufacturer.

E. Tape: 2 sided adhesive tape acceptable to membrane manufacturer.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces for conditions that would adversely affect execution. Do not proceed until unsatisfactory conditions are corrected. Beginning of installation constitutes acceptance of conditions.

B. Ensure surfaces are reasonably smooth and free of holes, cracks or projections which might be detrimental to successful installation.

C. Verify that items penetrating waterproofing system are securely installed.

D. Verify that concrete surfaces have cured a period of time acceptable to membrane manufacturer.

E. Verify that masonry joints are struck flush with face of unit or that a parge coat of mortar has been applied to face of masonry.

3.2 PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Clean and prepare surfaces in accordance with manufacturer's instructions.

C. Seal cracks and joints in accordance with manufacturer's instructions. Use proper depth-width ratio recommended by sealant manufacturer.

D. Remove sharp projections, fins, and loose material. Remove form ties to 3/4 inch minimum behind face of wall. Fill holes, voids, and honeycomb areas flush with concrete patching compound or cement mortar.

E. Seal penetrations in accordance with manufacturer's instructions.

F. Provide fillet or cant at junction of vertical and horizontal surfaces using liquid membrane. Extend liquid membrane 6 inches each way from corner at a minimum 90 mil thickness.

3.3 WATERPROOFING INSTALLATION

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

B. Apply latex surface conditioner at rate indicated by manufacturer. Condition only as much area as can be covered in same day.

C. Prior to placing full membrane, install minimum 3/4 inch cant of liquid membrane, extending 6 inches each way at a minimum 90 mil thickness. Provide membrane strips at inside corners, outside corners, and working joints. Center strips along axis of corner and/or joint.

D. Install sheets with edges and ends overlapped at dimensions recommended by manufacturer.

E. Remove release paper layer. Roll out surface with mechanical roller to encourage full contact bond.

F. Completely bond sheet to substrate, except those areas directly over or within 3 inches of working cracks or expansion joints.

G. Extend membrane vertically up wall surfaces adjacent to deck surfaces a minimum of 6 inches. Extend into floor drains.

H. Place uniform bead of mastic to joint edges at locations recommended by manufacturer.

I. Seal perimeter ends and edges to adjoining surfaces.

J. Seal items penetrating membrane with flashing membrane material and liquid membrane, ensuring positive seal with membrane and penetrating member.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Notify manufacturer prior to start of work and make arrangements for manufacturer's technical representative to be present during work to verify work is being conducted in accordance with their recommendations. Submit reports.

3.1 PROTECTION AND CLEANING

A. Protect adjacent surfaces from damages and stains. Clean materials from surfaces where inadvertently applied.

END OF SECTION

SECTION 07 19 00

WATER REPELLENTS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water repellent coating.

B. Application schedule.

1.2 QUALITY ASSURANCE

A. Perform work in accordance with manufacturer's printed instructions.

B. Maintain one copy of document on site.

1.3 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacture of water repellent coatings with five years minimum experience.

B. Applicator: Acceptable to manufacturer.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Include details of product description, tests performed, limitations to coating, cautionary procedures required during application, and chemical properties, including percentage of solids.

C. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

D. Submit manufacturer's certificate under provisions of Section 01 33 00 that products meet or exceed specified requirements and that their application was according to manufacturer's recommendation.

E. Submit manufacturer's certificate that products supplied comply with local regulations controlling the use of volatile organic compounds (VOC).

F. Submit manufacturer's test and inspection reports under provisions of Section 01 33 00.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit product data for coatings indicating VOC content under provisions of Section 01 81 13.

B. LEED Submittal: Submit laboratory test reports for coatings indicating compliance for low-emitting materials under provisions of Section 01 81 13.

1.6 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference two weeks prior to commencing work of this Section, under provisions of Section 01 31 00.

B. Review installation procedures and coordination required with related work.

1.7 FIELD SAMPLE

A. Apply coating to 24 sf area of each surface to be waterproofed where directed by Architect.

B. Apply number of coats specified. Color change or surface sheen is cause for rejection of product.

1.8 WARRANTY

A. Provide manufacturer's 5 year warranty for materials and their installation.

B. Warranty: Maintain treated surface free from penetration of moisture. Repair damage to interior surface of walls that moisture has penetrated.

1.9 REGULATORY REQUIREMENTS

A. Comply with applicable codes and regulations of governmental agencies having jurisdiction including those having jurisdiction over airborne emissions and industrial waste disposal. Where those requirements conflict with this specification, comply with the more stringent provisions.

B. Comply with the current applicable regulations of the California Air Resources Board (CARB) and the Environmental Protection Agency (EPA).

C. Comply with South Coast Air Quality Management District (SCAQMD) Rule 1113.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not apply coating when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Monopole International, Inc., www.monopoleinc.com.

B. Pecora Corp., www.pecora.com.

C. Pro So Co., Inc. www.prosoco.com.

D. Substitutions: Under provisions of Section 01 25 13.

2.2 MATERIALS

A. Coatings: Clear, non-yellowing formulations containing no silicones.

B. Monopole International, Inc., Aquaseal Micro Emulsion.

C. Pecora Corp., Klere-Seal 920-W Silane/Siloxane.

D. Pro So Co., Sure Kleen Weather Seal Siloxane WB.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify joint sealants are installed and cured.

B. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of coating.

C. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

A. Remove loose particles and foreign matter.

B. Remove oil or foreign substance with a chemical solvent which will not affect coating.

C. Protect adjacent surfaces not scheduled to receive coating.

D. If applied on unscheduled surfaces, remove immediately, by approved method.

3.3 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 29.

B. Manufacturer of water repellant coating shall provide the following inspection services:

1. Application start-up inspection.

2. Periodic inspections during application.

3. Certification of materials and application.

3.4 APPLICATION

A. Delay work until substrate is cured a minimum of 30 days.

B. Apply coating in two continuous successive wet-on-wet applications in accordance with manufacturer's instructions, using airless spray with coverage, recommended by manufacturer for substrate being coated.

3.5 PROTECTION AND CLEANING

A. Protect adjacent surfaces from damages and stains.

B. Clean materials from surfaces where inadvertently applied.

C. Protect finished installation under provisions of Section 01 61 00.

3.6 SCHEDULE

A. Exterior concrete masonry site walls.

B. Exterior vertical concrete surfaces.

C. Exterior vertical exposed to view concrete surfaces.

D. Exterior cement plaster surfaces.

E. Exterior manufactured stone masonry.

END OF SECTION

SECTION 07 21 16

BLANKET INSULATION

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Batt insulation and vapor barrier in exterior wall and roof construction.

B. Batt insulation for filling perimeter window and door shim spaces, crevices in exterior wall and roof.

C. Batt sound insulation in interior walls and partitions and above ceiling.

1.2 REFERENCES

A. ASTM C665 - Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

B. ASTM C1320 - Installation of Mineral Fiber Batt and Thermal Insulation for Light Frame Construction.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 6.

E. Business and Professions Code.

1.3 PERFORMANCE REQUIREMENTS

A. Materials of this Section shall provide continuity of thermal and moisture barrier at building enclosure elements.

B. Materials of this Section shall provide continuity of sound control where indicated or scheduled.

1.4 REGULATORY REQUIREMENTS

A. Installation of insulation may only commence if insulation meets mandatory manufacturer certification to the California Energy Commission required by Title 24, Part 6, Section 110.8 of the CBC - California Building Code, (CCR) California Code of Regulations that insulation complies with Title 24, Part 12, Chapter 12-13, Article 3 of the California Quality Standards for Insulating Materials.

B. Insulation products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Insulation materials to be certified in compliance with Business and Professions Code Section 19165.

D. Insulation manufacturer to be licensed by the California Department of Consumer Affairs, Bureau of Home Furnishing and Thermal Insulation according to Business and Professions Code, Section 19059.7.

1.5 SUBMITTALS

A. Submit manufacturer's certificates under provisions of Section 01 33 00 that materials meet or exceed specified regulatory requirements.

1.6 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit manufacturer's data for content of post-consumer and pre-consumer recycled content under provisions of Section 01 81 13.

B. LEED Submittal: Laboratory test results for insulation indicating requirements for low emitting materials according to Section 01 81 13.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS - INSULATION MATERIALS

A. Certain Teed Corp., www.certainteed.com.

B. Johns Manville Corp., www.jm.com.

C. Knauf Insulation, www.knaufinsulation.us.

D. Owens-Corning Fiberglass Corporation, www.owenscorning.com.

E. Substitutions: Under provisions of Section 01 25 13.

2.2 MATERIALS

A. Thermal Batt Insulation, Concealed Wall and Roof: ASTM C665 Preformed fiber glass batt, Type II Kraft Faced, Class C, Category 1 "SmartBatt", with stapling flange for attachment to applicable construction. Equivalent continuous roll membrane facing of "MemBrain" Continuous Air Barrier and Smart Vapor Retarder may be utilized in lieu of individual glass fiber batts. Provide R30 at roofs, R19 at walls.

B. Thermal Batt Insulation, Exposed Wall and Roof: ASTM C665 preformed glass fiber batt, Type III, Class A, with an FSK-25 reflective membrane faced surface that has a flame spread of 25 or less, and a smoke density of 50 or less when tested in accordance with ASTM E-84. Category 1 with stapling flanges for attachment of blanket to applicable construction. Equivalent continuous FSK-25 roll membrane facing may be utilized in lieu of individual faced glass fiber batts. Provide R30 at ceilings and roofs, R19 at walls.

C. Acoustical Batt Sound Insulation, Concealed Wall and Ceiling: ASTM C665 preformed glass fiber batt, Type I unfaced, with flame spread of 25 or less, and a smoke density of 450 or less when tested in accordance with ASTM E84. Provide 6-1/2 inch thickness.

D. Acoustical Batt Sound Insulation, Exposed Wall and Ceiling: ASTM C665 preformed glass fiber batt, Type III Class A with an FSK-25 reflective membrane faced surface that has a flame spread of 25 or less, and a smoke density of 50 or less when tested in accordance with ASTM E-84. Category 2. Provide 6-1/2 inch thickness.

E. Recycled Content: Post-consumer recycled content plus one-half of pre-consumer recycled content shall be not less than 25 percent.

F. Insulation to be formaldehyde-free.

G. Nails or Staples: Steel wire; electroplated; type and size to suit application.

H. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch wide.

I. Support Wire: 16 gauge steel wire.

J. Support Rods: 13 gauge, pointed spring steel length as required for stud spacing.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

B. Verify that enclosed spaces are ventilated to dissipate humidity.

C. Maximum relative humidity level of less than 50 percent shall be maintained during installation of insulation.

3.2 INSTALLATION

A. Install insulation in accordance with insulation manufacturer's instructions and ASTM C1320.

B. Install batt insulation in exterior walls and roof spaces without gaps or voids.

C. Fill any small spaces around door frames, window frames, skylight frames, and other wall or roof openings with insulation.

D. Fill hollow space of steel door frame, steel window frame and other wall or roof frame with insulation.

E. Fill hollow space created by wall or roof framed headers and jamb spaces with insulation.

F. Install batt sound insulation in interior walls full height of wall.

G. Install batt sound insulation above ceilings in areas as indicated. Extend a minimum of 4’-0” beyond face of vertical dividing partitions of space to be insulated where partition terminates at ceiling.

H. Trim insulation neatly to fit spaces.

I. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation. Leave no gaps or voids.

J. Install with factory applied membrane facing warm side of building spaces.

K. Lap ends and side flanges of vapor barrier membrane over face of framing members.

L. Extend vapor barrier on to any adjacent construction and tape seal edge of vapor barrier.

M. Seal butt ends, lapped flanges, and tears or cuts in membrane with tape or another layer of membrane.

N. Seal joints in vapor barrier caused by pipes, conduits, electrical boxes, and similar items penetrating vapor barrier.

O. Face staple flange over flange of adjacent blanket to wood studs at maximum 6 inches oc.

P. Friction fit sound insulation between studs and fill as required to completely fill space between the wall finishes.

Q. Where wall finish does not occur, use support rods spaced not-to-exceed 16 inches oc vertically at wood studs.

R. Retain unsupported roof insulation to metal or concrete substrate with spindle fasteners at 24 inches on center.

END OF SECTION

SECTION 07 31 13

ASPHALT SHINGLES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Asphalt shingle roofing.

B. Moisture shedding underlayment, eave, valley, and ridge protection.

1.2 REFERENCES

A. ASTM A653 - Steel Sheet, Zinc Coated, (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM A755 - Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

C. ASTM A924 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

D. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

E. ASTM D249 - Asphalt Roll Roofing Surfaced with Mineral Granules.

F. ASTM D3018 - Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules.

G. ASTM D3161 - Standard Test Method for Wind-Resistance of Asphalt Shingles.

H. ASTM D3462 – Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules.

I. ASTM D4586 - Asphalt Roof Cement, Asbestos Free.

J. NRCA - Roofing and Waterproofing Manual.

K. SMACNA - Architectural Sheet Metal Manual.

1.3 SUBMITTALS

A. Submit shop drawings, product data, and samples under provisions of Section 01 33 00.

B. Provide shop drawings indicating metal flashings, jointing methods, fastener types and spacing and installation details.

C. Provide product data indicating material characteristics, performance criteria and that materials meet specified standards.

D. Submit two samples of each shingle color indicating color range, finish texture and pattern.

E. Provide manufacturers instructions indicating materials installation requirements and procedures.

1.4 QUALITY ASSURANCE

A. Perform roofing in accordance with NRCA Steep Roofing Manual.

B. Perform flashing in accordance with SMACNA Architectural Sheet Metal Manual.

1.5 REGULATORY REQUIREMENTS

A. Conform to ASTM D3018 for class A fire resistance for shingle type specified.

B. Conform to ASTM D3161 for wind resistance rating when tested at a wind speed of 110 mph.

1.6 WARRANTY

A. Provide manufacturer's warranty for labor and materials for repair or replacement of defective shingles as necessary to maintain roof water tight and free of wind damage up to and including 110 mph.

B. Period of warranty to be for 30 years from date of substantial completion for water tightness and 5 years for wind damage.

2. PART 2 PRODUCTS

2.1 ASPHALT SHINGLE MANUFACTURERS

A. GAF Corporation - Timberline HDZ, www.gaf.com.

B. GAF Corporation - Timberline HDZ RS, www.gaf.com.

C. GAF Corporation - Timberline UHDZ, www.gaf.com.

D. Substitutions: Under provisions of Section 01 25 13.

2.2 ROOFING MATERIALS

A. Asphalt Shingles: Mineral-surfaced, self sealing, laminated multi-ply overlay construction fiberglass based strip shingle complying with ASTM D3018, Type I, self-sealing, bearing Class A external fire exposure label, ASTM D3462, and meeting ASTM D3161 for wind resistance. Color as selected by Architect from the manufacturer's complete range of colors from the series depicted in Part 2.1.

B. Hip and Ridge Shingles: Job-fabricated units cut from actual shingles used.

C. Roll Roofing: ASTM D249, Type I; Asphalt saturated roll roofing, 90 lb/square surfaced on weather side with mineral granules.

D. Underlayment: Spunbound reinforced polypropylene coated fabric sheet.

1. Premium Grade Feltex as manufactured by SystemComponents Corp., www.systemcomponents.net.

2. Premium Summit Synthetic Underlayment as manufactured by Atlas Roofing Corp., www.atlasroofing.com.

3. Roof Top Guard II Underlayment as manufactured by Underlayment Specialties Plus, www.uspunderlayment.com.

4. Substitutions: Under provisions of Section 01 25 13.

2.3 ACCESSORIES

A. Nails: Standard round wire shingle type of hot-dipped zinc-coated steel; minimum 7/16 inch head diameter and 11 gauge inch shank diameter of sufficient length to penetrate 3/4 inch through roof sheathing.

B. Plastic Cement: ASTM D4586, Type I.

2.4 FLASHING MATERIALS

A. Type as specified in Section 07 62 00.

3. PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Install asphalt shingle roofing over dry surfaces, free of ridges, warps, and voids.

B. Coordinate installation of roof mounted components or work projecting through roof. Verify roof openings are framed, sized, and located prior to installing work of this Section.

C. Completed installation to provide weathertight service.

3.2 EAVE PROTECTION INSTALLATION

A. Place metal eave edge flashing and gable edge flashing tight with fascia boards. Weather lap joints 2 inches and seal with plastic cement. Secure deck flange with nails spaced 8 to 10 inches.

B. Apply lap cement over eave edge flashing and embed an 18 inch wide underlayment starter strip flush with face of flashing. Secure in place. Lap ends 6 inches.

3.3 PROTECTIVE UNDERLAYMENT INSTALLATION

A. Install a 12 inch wide strip of underlayment over all seismic straps and plates.

B. Place one ply of underlayment weatherlapped minimum 6 inches at vertical ends and 4 inches at horizontal edges.

C. Stagger end laps of each consecutive layer. Nail protective underlayment to hold in place in accordance with manufacturer's recommendations.

D. Install protective underlayment perpendicular to slope of roof.

E. Weather lap and seal items projecting through or mounted on roof with plastic cement.

3.4 VALLEY PROTECTION INSTALLATION

A. Place one layer of metal flashing, minimum 24 inches wide, centered over valleys and crimped to guide water.

B. Weather lap joints minimum 4 inches.

C. Hem exposed edges and turn edge up.

D. Nail in place minimum 18 inches oc, 1 inch from edges.

3.5 FLASHING INSTALLATION

A. Installation to conform to requirements of Section 07 62 00.

3.6 ASPHALT SHINGLES INSTALLATION

A. Install starter strip of roll roofing or inverted shingles with tabs removed.

B. Fasten shingles in pattern, weather exposure and number of fasteners per shingle as recommended by manufacturer.

C. Comply with installation details and recommendation of shingle manufacturer and NRCA Steep Roofing Manual.

D. Project first course of shingles 3/4 inch beyond fascia board.

E. Extend shingles 1/2 inch beyond face of gable edge fascia board.

F. Cut shingles on slope of valleys to achieve uniform 4 inch exposure of metal valley flashing.

END OF SECTION

SECTION 07 42 49

FIBER CEMENT CLADDING SYSTEM

1. PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Factory finished fiber cement cladding system.

B. Underlayment.

C. Related trim, panel flashings, accessories and fasteners.

1.2 REFERENCES

A. AAMA 509 - Voluntary Test and Classification Method of Drained and Back Ventilated Rain Screen Wall Cladding Systems.

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

C. ASTM C1186 - Standard Specification for Flat Fiber-Cement Sheets.

D. ASTM E84 - Standard Test for Surface Burning Characteristics of Building Materials.

E. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

F. ASTM E228 - Standard Test Method for Linear Thermal Expansion of Solid Materials with a Vitreous Silica Dilatometer.

G. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

H. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

I. ASTM G23 - Standard Practice for Operating Light and Water Exposure Apparatus for Exposure of Nonmetallic Materials.

J. NFPA 268 - Ignition Resistance of Exterior Wall Assemblies.

K. NFPA 285 - Fire Test Method for Exterior Wall Assemblies Containing Combustible Material.

1.3 SYSTEM DESCRIPTION

A. Exterior, panelized fiber cement cladding system and accessories that combine to provide a complete drained and back-ventilated rainscreen.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00.

B. Submit shop drawings, including plans, sections, and installation details that demonstrate product dimensions, edge/termination conditions/treatments, compression and control joints, corners, openings, and penetrations.

C. Submit manufacturer's product description, storage and handling requirements, and installation instructions.

D. Submit product test reports and code compliance documents demonstrating product compliance from qualified, independent testing agencies.

E. Submit 2 samples of each product type proposed for use.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit manufacturer's product data for adhesives and sealants, Including printed statement of VOC content under provisions of Section 01 81 13.

B. LEED Submittal: Submit manufacturer's product data for paints and coatings, including printed statement of VOC content and chemical components under provisions of Section 01 81 13.

C. LEED Submittal: Submit manufacturer's data for content of post-consumer, pre-consumer recycled content under provisions of Section 01 81 13.

1.6 OPERATION AND MAINTENACE DATA

A. Submit maintenance data under provisions of Section 01 77 00.

B. Include cleaning and stain removal methods and recommended cleaning materials.

C. Include instructions on replacement of damaged panels.

1.7 QUALITY ASSURANCE

A. Quality Assurance: Under provisions of Section 01 43 00.

B. Perform work in accordance with specified standards and manufacturer's written instructions.

C. Maintain one copy of document on site.

1.8 QUALIFICATIONS

A. Manufacturer Qualifications:

1. Manufacturer of fiber cement cladding system shall have a minimum of 10 years of documented experience in fabricating and supplying products specified in this section.

2. Products specified in this section are to be manufactured in an ISO 9001 certified facility.

3. Manufacturer shall provide technical and design support as needed regarding installation and warranty compliance provisions.

B. Installer Qualifications: All products specified in this section are to be installed by a single installer trained by manufacturer with minimum 5 years documented experience.

1.9 REGULATORY REQUIREMENTS

A. Conform to CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

1.10 MOCKUP

A. Provide mockup under provisions of Section 01 43 00.

B. Provide a mock-up of wall cladding system as an evaluation tool for product and installation workmanship.

C. When accepted, mockup will demonstrate minimum standard for the Work.

D. Mockup may remain as part of the Work.

1.11 PRE-INSTALLATION CONFERENCE

A. Convene a conference two weeks prior to commencing work of this Section under provisions of Section 01 31 00.

B. Require attendance of parties directly affecting the work of this Section.

C. Verify and discuss substrate conditions, manufacturer's installation instructions, warranty requirements, and project requirements.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products to site under the provisions of Section 01 61 00.

B. Panels must be stored flat and kept dry before installation. A waterproof cover over panels and accessories should be used at all times prior to installation.

C. If panels are exposed to water or water vapor prior to installation, allow to completely dry before installing. Failure to do so may result in panel shrinkage at joints, and such action will void warranty.

D. Panels must be carried on edge. Do not carry or lift panels flat. Improper handling may cause cracking or panel damage.

E. Direct contact between the panels and the ground should be avoided at all times.

F. Keep panels clean during installation process.

1.13 SEQUENCING AND SCHEDULING

A. Sequence work under provisions of Section 01 11 00.

B. Schedule work under the provisions of Section 01 32 00.

1.14 WARRANTY

A. Provide manufacturer's 50-year warranty against manufactured defects in fiber cement panels.

B. Provide manufacturer's 15-year warranty against manufactured defects in panel finish.

C. Warranty is applicable for the original installation.

2. PART 2 PRODUCTS

2.1 MANUFACTURER

A. Basis of Design Manufacturer: James Hardie Building Products, Inc., www.jameshardie.com.

B. Panels:

1. Lap Siding: Hardie Plank Lap Siding with select Cedarmill finish.

2. Soffit: Hardie Soffit, Vented, with select Cedarmill finish.

3. Trim: HardieTrim with select Rustic Grain finish.

4. Color: As selected by Architect from the manufacturer's complete range of colors - "Statement Collection".

C. Substitutions: Under provisions of Section 01 25 13.

2.2 PANEL MATERIALS

A. Fiber Cement Panels: Manufactured from a pressed, stamped, and autoclaved mix of portland cement, fly ash, silica, recycled panels, and wood fiber bundles.

B. Panel Surface: Pre-finished and machine applied.

2.3 PANEL PERFORMANCE REQUIREMENTS:

A. Fiber Cement Panels, ASTM C1186, Type A, Grade II requirements:

1. Wet Flexural Strength, lower limit: 1015 psi.

2. Water Tightness: No water droplets observed on any specimen.

3. Freeze-thaw: No damage or defects observed.

4. Warm Water: No evidence of cracking, delamination, swelling, or other defects observed.

5. Heat-Rain: No crazing, cracking, or other deleterious effects, surface or joint changes observed in any specimen.

2.4 UNDERLAYMENT

A. Underlayment

1. Underlayment: Tyvek as manufactured by E.I. DuPont de Nemours, www.tyvek.com.

(a) First layer: Commercial Wrap D.

(b) Second layer: Commercial Wrap.

2. Other acceptable underlayment: Dryline Building Wrap CP and Rain Drain as manufactured by National Shelter Products, Inc. www.drylinewrap.com.

3. Substitutions: Under provisions of Section 01 25 13.

2.5 INSTALLATION COMPONENTS

A. Fasteners: Corrosion resistant fasteners, hot-dipped galvanized screws.

B. Metal Flashing: Prefinished galvanized sheet steel flashing as specified under provisions of Section 07 62 00.

C. Penetration Flashing: Tyvek flashing system. Straight flash for jambs and heads, FlexWrap for sills. Equivalent as manufactured by the Polymer Group, Inc. or National Shelter Products, Inc.

D. Sealant: One-part nonacid curing silicone as specified under provisions of Section 07 92 00.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Verify that surfaces and site conditions are ready to receive Work. Notify Architect in writing of all unsatisfactory surfaces and conditions.

B. Do not begin installation until unacceptable conditions have been corrected.

C. Beginning of installation means installer accepts existing substrate conditions

D. Do not install panels or components that appear to be damaged or defective.

E. Do not install wet panels.

3.2 INSTALLATION - UNDERLAYMENT

A. On vertical surfaces apply 2 layers of underlayment over substrate; weather lap horizontal edges 6 inches, vertical edges 6 inches. Fasten in place at 12 inches on center vertically over stud. Tape seal joints and penetrations on base layer.

B. Install penetration flashing around all openings and penetrations in exterior walls in compliance with underlayment manufacturers recommendations. Turn sill flashing up 6 inches at jambs. Extend flashing back onto sill, jamb, and head of all openings.

3.3 FIBER CEMENT CLADDING SYSTEM INSTALLATION

A. General: Install products in accordance with manufacturer's written installation guidelines and in compliance with Section 01 73 00.

B. Coordinate installation with metal flashings specified under Section 07 62 00.

C. Review all manufacturer installation, maintenance instructions, and other applicable documents before installation.

D. Panel Cutting

1. Cut fiber cement panels outside or in a well-ventilated area. Do not cut in an enclosed area.

2. Follow manufacturer's recommended procedures when cutting fiber cement panels.

E. Trim: Install corner strips, closures, and trim.

F. Sealant: Install sealant to prevent weather penetration.

3.4 TOLERANCES

A. Tolerances: Under the provisions of Section 01 43 00.

B. Wall and Trim: Plumb and level within + / - ¼ inch in 20'-0" in any direction.

C. Joint Alignment: Maximum offset 1/16 inch.

3.5 CLEANING AND MAINTENANCE

A. Clean finished surfaces according to manufacturer guidelines for care and maintenance.

B. Touch up damaged prefinished surfaces.

C. Replace panels that are damaged and cannot be repaired.

3.6 RECYCLING CONSTRUCTION WASTE

A. Recycle excess material waste under provisions of Section 01 74 19.

END OF SECTION

SECTION 07 52 00

MODIFIED BITUMINOUS MEMBRANE ROOFING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cleaning deck surface.

B. Membrane roofing and base flashings.

1.2 REFERENCES

A. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction.

B. ASTM B749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.

C. ASTM C728 - Perlite Thermal Insulation Board.

D. ASTM D312 - Asphalt Used in Roofing.

E. ASTM D412 - Rubber Properties in Tension.

F. ASTM D2523 - Testing Load-Strain Properties of Roofing Membranes.

G. ASTM D4601 - Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.

H. ASTM D6083 – Standard Specification for Liquid Applied Acrylic Coating Used in Roofing.

I. ASTM D6162 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.

J. ASTM D6163 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.

K. ASTM D6221 - Standard Specification for Reinforced Bituminous Flashing Sheets on Roofing and Waterproofing.

L. ASTM E408 – Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection – Meter Techniques.

M. ASTM E903 – Standard Test Method for Solar Absorption, Reflectance, and Transmittance of Materials Using Inspection - Meter Techniques.

N. CBC – California Building Code, (CRC) California Code of Regulations, Title 24, Part 6.

O. CRRC – Cool Roof Rating Council – Product Rating Program CRRC-1.

P. FM (FM Global) - Roof Assembly Classifications.

Q. NRCA - National Roofing Contractors Association.

R. UL (Underwriters Laboratories) - Fire Hazard Classifications.

1.3 SYSTEM DESCRIPTION

A. Modified Bitumen Conventional Roofing System: Three layer SBS membrane system having a granulated surfacing.

1.4 SUBMITTALS

A. Submit manufacturer's product data, summary of weights of materials and installation instructions under provisions of Section 01 33 00.

B. Submit documentation of conformance of roofing system with regulatory requirements specified under provisions of Section 01 33 00.

1.5 SUSTAINABLE DESIGN SUBMITTAL

A. LEED Submittal: Submit manufacturer's product data under provisions of Section 01 81 13 that certifies roofing system is Energy Star compliant under the U. S. Environmental Protection Agency (EPA) Energy Star Program.

B. LEED Submittal: Submit manufacturer's product data for adhesives and sealants, including statement of VOC content under provisions of Section 01 81 13.

1.6 QUALITY ASSURANCE

A. Perform Work according to roofing system manufacturer's written instructions and applicable recommendations of the NRCA Roofing and Waterproofing Manual and the NRCA Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing.

B. Maintain a copy of the manufacturer's written instructions and the applicable recommendations of the referenced NRCA publications on site.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with five years documented experience.

B. Applicator: Company specializing in performing the Work of this Section with five years documented experience and approved by system manufacturer.

C. Work of this Section to conform to manufacturer's instructions.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable UL and FM requirements for roof assembly requirements.

B. Fire Hazard Classification: UL Class B.

C. Conform to CBC – California Building Code, (CCR) California Code of Regulations, Title 24, Part 6 requirements for a Cool Roof under the Product Rating Program CRRC-1 of the Cool Roof Rating Council.

D. Windstorm Rating: FM I-90.

1.9 PRE-INSTALLATION CONFERENCE

A. Convene two weeks prior to commencing Work of this Section, under provisions of Section 01 31 00.

B. Review installation procedures and coordination required with related Work.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 61 00.

B. Deliver products in manufacturer's original containers, dry, undamaged, seals and labels intact.

C. Store products in weather protected environment, clear of ground and moisture.

D. Store products in a manner to avoid significant or permanent deflection of roof deck.

E. Stand roll materials on end.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Do not apply roofing membrane during inclement weather.

B. Do not apply roofing membrane to damp or frozen deck surface.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

1.12 COORDINATION

A. Coordinate work under provisions of Section 01 31 00.

B. Coordinate the work with installation of associated metal flashings as the work of this Section proceeds.

C. Notify roofing manufacturer 72 hours prior to commencing work to arrange for inspection of roof application.

1.13 WARRANTY

A. Provide 20 year manufacturer's warranty under provisions of Section 01 77 00.

B. Manufacturer's Warranty: No Dollar Limit Warranty covering roof membrane, base flashings, and workmanship equivalent to Signature Series Guarantee offered by the Johns Manville Corporation. Warranty to include repair of roof membrane damage due to windstorms less than or equal to 64 mph.

C. Provide 2 year roofing installers warranty under provisions of Section 01 77 00.

D. Roofing Installers Warranty: Warranty shall cover the Work of this section, including installation of all components of roofing system to include roofing membrane, base flashings, fasteners, coatings, sealants, and all penetrations of roofing membrane.

1.14 INSPECTION SERVICE

A. Manufacturer of the roofing materials shall provide the following services:

1. Application start-up inspection.

2. Periodic inspections during application.

3. Certification of materials used and application.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS - MEMBRANE MATERIALS

A. Johns Manville Corp., System 3CND CR-HW, www.jm.com.

B. Other acceptable manufacturers offering equivalent products:

1. GAF, www.gaf.com.

2. M B Technology, www.mbtechnology.com.

3. Certain Teed, www.certainteed.com.

C. Substitutions: Under provisions of Section 01 25 13.

2.2 MEMBRANE MATERIALS

A. Granulated Membrane Cap Sheet: ASTM D6162, Type I, Grade G Asphalt and polymer modifiers of styrene-butadiene-styrene (SBS) type, reinforced with nonwoven polyester and fiberglass, equivalent to Dynakap FR T1 CR G as manufactured by Johns Manville Corp., with the following characteristics:

Thickness	:	157 mils at 75 degrees F
Average Weight	:	95 lb/100 sq ft
Sheet Width	:	39 3/8 inch
Tensile Strength	:	160lbf XMD and 165lbf MD when tested in accordance with ASTM D5147
Elongation at Peak Load	:	5 percent when tested in accordance @ 0°F with ASTM D5147
Ultimate Elongation	:	40 percent when tested in accordance with ASTM D5147
Granular Surfacing	:	White granular surface with reflective coating.
Solar Reflectance	:	0.70 when tested by the CRRC
Emissivity	:	0.90 when tested by the CRRC

A. Intermediate Sheet: ASTM D6163, Type II, Grade S, SBS modified bitumen coated glass fiber reinforced membrane, DynaBase as manufactured by the Johns Manville Corporation.

B. Glass Fiber Base Sheet: ASTM D4601, Type II, GlasBase Plus as manufactured by the Johns Manville Corporation.

2.3 BITUMINOUS MATERIALS

A. Asphalt Bitumen: ASTM D312, Type IV.

B. Flashing Compound: Elastomeric adhesive specially formulated to be compatible to SBS modified bitumen roll goods; asbestos free.

2.4 ROOF SURFACING

A. Acrylic Roof Top Coat: 100 percent acrylic elastomeric roof coating, white in color, conforming to the following:

Properties	Test	Results
Solids	ASTM D6083	60 percent
Elongation	ASTM D6083	250 percent
Tensile Strength	ASTM D6083	250 SI
Flexibility	ASTM D6083	180 degree bend at – 30 degree F
Solar Reflectance (albedo x 100)	ATSM E903	0.75 percent
Emisivity	ASTM E408	0.90 percent

2.5 BASE FLASHINGS

A. Base Flashing: Flexible sheet flashing, ASTM D6221, Type 1, modified bitumen, granule surfaced, equivalent to Dynaflex, as manufactured by the Johns Manville Corporation.

2.6 CANT STRIPS

A. ASTM C728, fire resistant expanded Perlite, preformed to 45 degree angle, 4 inch minimum face dimension.

2.7 TAPERED EDGE STRIPS

A. ASTM C728 fire resistant expanded perlite, configuration as detailed.

2.8 ACCESSORIES

A. Roofing Nails: Galvanized or non-ferrous type, size as required to suit application.

B. Lead Sheet: ASTM B749, Type L51121, copper-bearing lead sheet, 2-1/2 to 4 lbs./sq. ft.

C. Copper Sheet: ASTM B370, Temper H00 of H01, cold-rolled copper sheet, 16 oz./sq. ft.

D. Slip Sheet: 0.05 lb/sq. ft. rosin sized building paper.

E. Acrylic Coating Accessories: Acrylic prime coat, 3.0 oz./sq. yd. polyester reinforcing fabric, adhesives, elastomeric caulking compounds and similar materials shall be as approved by the coating manufacturer. Sealants and adhesives shall meet South Coast Air Quality Management District (SCAQMD) Rule 1168.

2.9 SUMMARY OF MATERIALS PER 100 SQUARE FEET

Base sheet (1 ply)	28 lbs.
Intermediate sheet (1 ply)	56 lbs.
Asphalt moppings (2 @ 23 lbs.)	46 lbs.
Cap sheet (1 ply)	116 lbs.
Acrylic Prime Coat (1-1/2 gal/coat)	18 lbs.
Acrylic Top Coat (2 @ 1-1/2 gal/coat)	36 lbs.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify that deck is supported and secured.

C. Verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains, valleys, or eaves.

D. Verify that deck surfaces are dry and free of snow or ice.

E. Confirm dry deck by moisture meter with 15 to 19 percent moisture maximum.

F. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, and reglets are in place.

G. Beginning of installation means installer accepts existing surfaces.

3.2 PROTECTION

A. Protect building surfaces against damage from roofing work.

3.3 PREPARATION

A. Verify flatness and tight joints of wood decking. Fill knot holes with latex filler.

B. Loose lay slip sheet.

C. Prime metal flashings with asphalt primer.

D. Install tapered edge strips, 1-1/2 inch thick x 24 inch wide, at all roof penetrations and at all intersections of roof with vertical surfaces.

E. Nail cants 2 feet o.c. to roof deck. Fit flush at ends and to vertical surfaces. Apply cant 2 inches back from flange and bevel 8 inches from ends at scuppers.

3.4 ASPHALT

A. Mop Application: Apply asphalt at a temperature range of between 400 degrees to 450 degrees F or per manufacturer's printed EVT range.

B. Mechanical Spreader: Apply asphalt at a temperature range of between 425 degrees to 475 degrees F or per manufacturer's printed EVT range.

C. Asphalt shall not be heated above maximum temperature. Asphalt which has been overheated shall be rejected.

D. Kettle shall be equipped with an accurate thermostat and thermometer.

3.5 BASE SHEET APPLICATION

A. Lay a strip of base sheet, 8 inches wide, over metal straps and mechanical anchors exposed on deck surface. Fasten in place.

B. Lay base sheet; lap side edges 3 inches, end laps 4 inches. Nail laps 9 inches o.c. Nail the field area with two rows of nails at 11 inches o.c. staggered, on 18 inch centers.

3.6 MEMBRANE APPLICATION

A. Temperature of Bitumen at Point of Application: Within 25 degrees F of bitumen rating labeled on bitumen container.

B. Lap intermediate sheet edges 3 inches, cap sheet edges 4 inches.

C. Apply membrane in bitumen; seal seams and ends permanently waterproof.

D. Apply membrane smooth, free from air pockets, wrinkles, or tears.

E. Reinforce valleys with an additional ply of base sheet 36 inches wide, center over valley. Apply in direction of slope of valley, lapping 4 inches on ends. Solid mop to base sheet.

F. Extend membrane up cant strips.

G. Install waterproof cut-off to membrane at end of day's operation. Remove cut-off before resuming roofing.

H. Mop and seal membrane around roof penetrations.

3.7 FLASHINGS AND ACCESSORIES

A. Coordinate installation of roof drains and related flashings.

B. Set base sheet at roof drains in flashing compound 9 inches wide around ring and flange. Provide a minimum 30 inch square, lead or copper flashing set in flashing compound over base sheet. Strip in flashing with two plies of intermediate membrane extending 4 inches and 6 inches beyond the outside edge of flashing. Solid mop flashings, and while hot, embed cap sheet, install clamp ring and tighten entire assembly while membrane is hot.

C. Seal flashings and flanges of items penetrating membrane.

D. Install prefabricated roofing expansion joint covers to isolate roof areas as indicated on drawings and in accordance with manufacturer's recommendations.

E. Apply granule surfaced membrane base flashings to seal membrane to vertical elements. Extend a minimum of 8 inches up vertical surfaces and 4 inches out onto field membrane.

F. Secure to nailing strips at 6 inches o.c.

G. Repair edge seams of membrane base flashing with emulsion and granules where bitumen extends beyond seam.

3.8 ACRYLIC ROOF COATING

A. Repair imperfections in roof field or flashing areas with sealant.

B. Apply prime coat approximately 3’-10” wide at all valleys, waterways, drain areas, junctions of vertical wall surfaces, mechanical equipment and roof penetrations at the rate of 2 gallons per 100 square feet.

C. Immediately embed a 3’-4” wide polyester reinforcing fabric into the wet prime coat.

D. Lap joints in fabric a minimum of 3 inches. Extend fabric up vertical wall and curb surfaces a minimum of 6 inches.

E. Apply a second prime coat immediately onto polyester fabric at the rate of 1 gallon per 100 square feet. Extend prime coat a minimum of 2 inches beyond edge of fabric.

F. Allow prime coat to dry for 24 hours.

G. Apply roof prime coat over entire roof surface at the rate of 1-1/2 gallons per 100 square feet.

H. Extend prime coat up vertical wall surface 3 inches minimum above termination of base flashing.

I. Allow prime coat to dry for 24 hours.

J. Apply first application of roof top coating at the rate of 1-1/2 gallons per 100 square feet.

K. Allow first application of roof top coating to dry for a minimum of 12 hours.

L. Apply second application of roof top coating in a perpendicular pattern to first application at the rate of 1-1/2 gallons per 100 square feet.

M. Cut edges of final roof top coating application evenly and uniformly.

3.9 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01 45 29.

B. Correct identified defects or irregularities.

C. Site attendance of roofing materials manufacturers during installation of the Work is required.

3.10 CLEANING

A. Remove bituminous markings from finished surfaces.

B. In areas where finished surfaces are soiled by Work of this Section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

C. Repair or replace defaced or disfigured finishes caused by Work of this Section.

3.11 PROTECTION

A. Protect building surfaces against damage from roofing work.

B. Upon completing roofing, including associated work, institute appropriate procedures for surveillance and protection of roofing during remainder of construction period.

C. Where traffic must continue over finished roof membrane, protect surfaces.

D. At end of construction period, or at a time when remaining construction will in no way affect or endanger roofing, inspect roofing and prepare a written report with copies to Architect describing nature and extent of deterioration or damage found.

E. Repair or replace, as required, deteriorated or defective work found at time of above inspection to a condition free of damage and deterioration at time of Substantial Completion according to requirements of specified warranty.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pre-coated coping parapet and cap flashings.

B. Fascias.

C. Counter flashing at piping penetrations, vent pipes, and conduits.

D. Counterflashings over bituminous base flashings.

E. Counterflashings at roof mounted equipment, curbs and supports.

F. Counterflashings for roof hatches.

1.2 REFERENCES

A. ANSI / SPRI ES-1 Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.

B. ASTM A653 - Steel Sheet, Zinc-Coated, (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM A755 - Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

D. ASTM A792 – Steel Sheet, Aluminum-Zinc Alloy. Coated by the Hot-Dip Process, General Requirements.

E. ASTM A924 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

F. ASTM B32 - Solder Metal.

G. ASTM B101 - Standard Specifications for Lead-Coated Copper Sheet and Strip for Building Construction.

H. ASTM D4586 - Asphalt Roof Cement, Asbestos Free.

I. SMACNA - Architectural Sheet Metal Manual.

1.3 SYSTEM DESCRIPTION

A. Work of this Section is to physically protect membrane roofing, and base flashings, from damage that would permit water leakage to building interior.

1.4 QUALITY ASSURANCE

A. Applicator: Company specializing in sheet metal flashing work with five years minimum experience.

B. Perform work in accordance with SMACNA standard details and requirements.

C. Copings and roof edge flashings shall conform to SPRI ES-1 testing and shall be in compliance with SMACNA Technical Resource Bulletin #5-09.

D. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings capable of resisting an ultimate design wind speed of 115 miles per hour.

1.5 SUBMITTALS

A. Submit shop drawings, product data, and samples under provisions of Section 01 33 00.

B. Submit shop drawings of sheet metal items indicating profiles, jointing, terminations and installation details. Indicate type and spacing of fasteners.

C. Submittal of specific plates from the SMACNA Architectural Sheet Metal Manual constitutes acceptable documentation of installation details.

D. Submit product data for pre-coated galvanized steel.

E. Submit two samples, 4 x 4 inch in size illustrating metal finish color for pre-coated steel.

F. Submit product data for flashing accessories.

G. Submit warranty for water tightness.

H. Submit warranty for metal finish.

1.6 STORAGE AND HANDLING

A. Store products under provisions of Section 01 61 00.

B. Stack preformed material to prevent twisting, bending, or abrasion, and to provide ventilation.

C. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

1.7 WARRANTY

A. Provide warranty under provisions of Section 01 77 00.

B. Provide 2-year warranty coverage for degradation of water tightness and integrity of seals.

C. Provide 20-year warranty coverage for metal finish from all defects.

2. PART 2 PRODUCTS

2.1 SHEET MATERIALS

A. At Exposed to View Flashings and Fascias:

1. Pre-Coated Galvanized Steel: ASTM A755 on zinc-coated galvanized substrate, ASTM A653, Grade 33, G90 zinc coating in accordance with ASTM A924 or ASTM A792, Grade 50, AZ55 aluminum zinc coating; 0.0299 inch thick core steel.

B. At Concealed Flashings and Trim:

1. Galvanized Steel: ASTM A653, Grade 33, G90 zinc coating in accordance with ASTM A924, 0.0299 inch thick core steel.ACCESSORIES.

C. Lead-Coated Copper: ASTM B101, Temper H00 and H01, cold-rolled copper sheet, coated both sides with lead weighing not less than 12 lb/100 sq. ft. or more than 15 lb./100 sq. ft. total weight of copper sheet with lead applied to both sides.

D. Fastener: Galvanized steel or stainless steel with soft neoprene washers at exposed fasteners. Finish exposed fasteners same as pre-coated metal.

E. Underlayment: Spunbound reinforced polypropylene coated fabric sheet.

1. Premium Grade Feltex as manufactured by SystemComponents Corp., www.systemcomponents.net.

2. Premium Summit Synthetic Underlayment as manufactured by Atlas Roofing Corp., www.atlasroofing.com.

3. Roof Top Guard II Underlayment as manufactured by Underlayment Specialties Plus, www.uspunderlayment.com.

4. Substitutions: Under provisions of Section 01 25 13.

F. Metal Primer: As specified in Section 09 90 00.

G. Protective Backing Paint: Zinc chromate alkyd.

H. Slip Sheet: 0.05 lb./sq. ft., rosin sized building paper.

I. Sealant: Type specified in Section 07 92 00.

J. Bedding Compound: Rubber-asphalt type.

K. Plastic Cement: ASTM D4586, Type I.

L. Metal Flashing System: Two piece pre-coated galvanized steel similar to Springlok Flashing System, manufactured by Fry Reglet, www.fryreglet.com, type as indicated. Include fabricated end closures and mitered corners.

M. Solder for Lead-Coated Copper: ASTM B32, Grade SN 60 percent tin, 40 percent lead.

2.2 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate concealed cleats of galvanized steel, ASTM A653, Grade 33, G90 zinc coating, 0.0478 inch thickness, interlockable with sheet.

C. Fabricate exposed cleats and coverplates of same material as sheet, interlockable with sheet.

D. Form pieces in longest practical lengths.

E. Hem exposed edges on underside 1/2 inch. Miter and seam corners.

F. Form material with flat lock seam.

G. Solder and seal metal joints. After soldering, remove flux. Wipe and wash solder joints clean.

H. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

I. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

J. Fabricate flashings to allow toe to extend 2 inches over roofing surface. Return and brake edges.

K. Fabricate vent pipe and roof penetration flashings of lead-coated copper with clamping ring.

2.3 FINISH

A. At Concealed Locations:

1. Shop prepare and prime exposed ferrous metal surfaces.

2. Back-paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

B. At Exposed to View Flashings and Fascias:

1. Kynar 500 or Hylar 5000 shop pre-coated finish with 0.2 mil baked on primer and 0.8 mil baked on topcoat for a 1.0 mil dry film thickness. Custom color to be selected by Architect. Up to three (3) custom colors to be selected for use in varying amounts at all exposed to view flashing and fascia locations.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets are in place, and nailing strips located.

B. Verify membrane termination and base flashings are in place, sealed, and secure.

C. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Field measure site conditions prior to fabricating work.

B. Install starter and edge strips, and cleats before starting installation.

C. Install surface mounted reglets true to line and level. Seal top with sealant.

D. Install underlayment with protective slip sheet over parapets, caps, copings, gravel stops and curbs.

3.3 INSTALLATION

A. Conform to indicated details on the drawings and the recommendations included in the SMACNA Architectural Sheet Metal Manual.

B. Provide for thermal expansion of exposed sheet metal work. Space movement joints at 10 feet - 0 inches o.c. maximum with no joints within 2 feet - 0 inches of corners.

C. Form expansion joints of intermeshing hooked flanges filled with sealant.

D. Insert flashings into reglets to form tight fit. Secure in place with lead wedges at maximum 12 inches on center. Pack remaining spaces with lead wool. Seal flashings into reglets with sealant.

E. Secure flashings in place using concealed fasteners. Use exposed fasteners only where indicated.

F. Lap, lock, seam and seal all joints.

G. Apply plastic cement compound between metal flashings and felt flashings. Apply bituminous coating between dissimilar metals where occurs.

H. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

I. Roof-Penetration, Vent Pipe Flashing: Turn lead flashing down inside vent piping. Clamp flashing to other pipes penetrating roof except for vent piping. Seal with elastomeric sealant.

J. Seal metal joints watertight.

3.4 FIELD QUALITY CONTROL

A. Conform to SMACNA Architectural Sheet Metal Manual.

B. Field observation will involve surveillance of Work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 07 71 23

MANUFACTURED GUTTERS AND DOWNSPOUTS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Galvanized steel gutters and downspouts.

B. Steel pipe downspouts.

1.2 REFERENCES

A. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless.

B. ASTM A123 - Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products.

C. ASTM A653 - Steel Sheet, Zinc Coated, (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

D. ASTM A755 - Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

E. ASTM A792 - Steel Sheet, Aluminum-Zinc Alloy. Coated by the Hot-Dip Process, General Requirements.

F. ASTM A924 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

G. SMACNA - Architectural Sheet Metal Manual.

1.3 SUBMITTALS

A. Submit shop drawings, product data, and samples under provisions of Section 01 33 00.

B. Submit shop drawings of metal items indicating profiles, jointing, terminations, and installation details. Indicate type and spacing of fasteners.

C. Submittal of specific plates from the SMACNA Architectural Sheet Metal Manual constitutes acceptable documentation of installation details.

D. Submit product data for pre-coated galvanized steel.

E. Submit two samples 4 x 4 inch in size illustrating metal finish color for pre-coated steel.

F. Submit warranty for metal finish.

1.4 QUALITY ASSURANCE

A. Applicator: Company specializing in sheet metal work with five years minimum experience.

B. Perform work in accordance with SMACNA standard details and requirements.

1.5 STORAGE AND HANDLING

A. Store products under provisions of Section 01 61 00.

B. Stack preformed material to prevent twisting, bending, or abrasion and to provide ventilation.

C. Prevent contact with materials during storage which may cause discoloration, staining or damage.

1.6 WARRANTY

A. Provide warranty under provisions of Section 01 77 00.

B. Provide 20-year warranty coverage for metal finish from all defects.

2. PART 2 PRODUCTS

2.1 MATERIALS

A. Pre-coated Galvanized Steel: ASTM A755 on zinc-coated galvanized substrate, ASTM A653, Grade 33, G90 zinc coating in accordance with ASTM A924, or ASTM A792, Grade 50, AZ55 aluminum zinc coating. thickness as specified.

2.2 COMPONENTS

A. Gutters 0.0299 inch thick.

B. Downspouts: ASTM A53, Grade B, Schedule 40 steel pipe, standard weight, Type S, one piece without joints, galvanized according to ASTM A53; 1.8 oz./sq. ft.

2.3 ACCESSORIES

A. Anchorage Devices: Meet SMACNA requirements.

B. End Caps, Downspout Outlets and Strainers, Rain Diverters, Straps, Support Brackets, Joint Fasteners. Profiled to suit gutters and downspouts.

C. Sealant: Silicone type as specified in Section 07 92 00.

2.4 FABRICATION

A. Form gutters and downspouts of profiles and sizes indicated.

B. Field measure site conditions prior to fabricating work.

C. Fabricate with required connection pieces.

D. Form sections square, true, and accurate in size, in maximum possible lengths and free of distortion or defects detrimental to appearance or performance.

E. Hem exposed edges of metal.

F. Seal metal joints.

G. Fabricate gutter and downspout accessories; seal watertight.

H. Form splash pans to size as detailed with rolled edges.

2.5 FINISHING

A. Kynar 500 or Hylar 5000 shop pre-coated finish on flat sheet metal stock. Finish with 0.2 mil baked on primer and 0.80 mil baked on topcoat for a 1.0 mil dry film thickness. Color to be selected by Architect from manufacturer's entire range of standard and custom colors.

B. Galvanize assembled steel pipe downspouts after fabrication to minimum 1.25/oz sq ft zinc coating in accordance with ASTM A123. Site paint under provisions of 09 90 00. Color to be selected by Architect.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with SMACNA requirements.

B. Join lengths with seams sealed watertight. Flash and seal gutters to downspouts and accessories.

C. Seal metal joints watertight.

END OF SECTION

SECTION 07 72 33

ROOF HATCHES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Prefabricated roof hatches with integral support curbs, operable hardware, and counterflashings.

B. Roof hatch railing system.

1.2 REFERENCES

A. OSHA - Standards of Occupational Safety and Health Administration.

1.3 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Provide data on unit construction, sizes, configuration, jointing methods, attachment methods, operation and accessories.

C. Manufacturer and/or fabricator shall submit a certificate of product compliance with OSHA Standards.

1.4 REGULATORY REQUIREMENTS

A. OSHA regulations as applicable to roof access hatches, 29 CFR 1910.23.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Babcock-Davis Hatchways, Inc., www.babcockdavis.com.

B. Bilco Co., www.bilco.com.

C. Dur-Red Products, www.activarcpg.com.

D. Lane-Aire, www.lane-aire.com.

E. Milcor, Inc., www.milcorinc.com.

F. Nystrom Building Products, www.nystrom.com.

G. Precision Ladders, LLC, www.precisionladders.com.

H. Substitutions: Under provisions of Section 01 25 13.

2.2 ROOF HATCHES

A. Unit: 2'-6" x 3'-0" size, single leaf type.

B. Curb: 0.090 inch thick aluminum curb with one inch rigid insulation; integral cap flashing to receive roof flashing system; extended flange for mounting. Fabricate curbs to maintain a minimum 12 inches above roofing surface.

C. Cover: 0.090 inch thick aluminum cover with 1 inch rigid insulation retained by inner liner. Continuous gasket to provide weatherproof seal. [Single [clear] [white] [polycarbonate dome.]

D. Hardware: Manufacturer's standard manually operated type with compression spring operators, positive snap latch with turn handles inside and out and padlock hasp inside; automatic hold-open arm with vinyl covered grip handle for easy release; galvanized finish.

E. Hinges: Manufacturer's recommended type.

2.3 RAILING SYSTEM

A. Hatch manufacturer’s pipe rail safety rail system that meets the requirements of OSHA 1910.23.

B. Hatch Access Protection: Self-latching hinged gate.

C. Substitutions: Under provisions of Section 01 25 13.

2.4 HATCH FABRICATION

A. Fabricate free of visual distortions and defects. Weld corners and joints.

B. Provide for removal of condensation.

C. Provide weathertight assembly.

D. Sloped Roofs: Taper curbs to maintain top level.

2.5 FINISH

A. Shop prime paint all exposed metal.

B. Site paint metal surfaces under provisions of Section 09 90 00.

3. PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions. Coordinate with installation of roofing system and related flashings. Provide weather tight installation.

B. Permanently bolt railing system to roof hatch curb in accordance with manufacturer's instructions.

C. Apply bituminous paint on metal surfaces of units in contact with cementitious materials and dissimilar metals.

3.2 ADJUSTING

A. Adjust hinges for smooth operation.

B. Adjust latching mechanisms for positive engagement.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

B. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

C. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.

D. Sealant joints in fire-resistance-rated construction.

E. Fireproof firestopping and firesafing materials and accessories.

1.2 REFERENCES

A. ASTM C920 - Elastomeric Joint Sealants.

B. ASTM C1193 - Use of Joint Sealants.

C. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

D. ASTM E119 - Method for Fire Tests of Building Construction and Materials.

E. UL - Fire Hazard Classifications.

F. UL 1479 - Fire Tests of Through-Penetration Firestops.

G. 40 CFR Part 763, Subpart F (7-1-90 Edition) - Asbestos Hazardous Emergency Response Act, Friable Asbestos - Containing Materials in Schools.

1.3 DEFINITION

A. Firestopping (Firesafing): A sealing or stuffing material or assembly placed in spaces between building materials to arrest the movement of smoke, heat, gases, or fire through wall or floor openings.

1.4 SYSTEM DESCRIPTION

A. F-Rated Through Penetration Firestop Systems: F-ratings as required according to UL 1479, but not less than that equaling or exceeding fire resistance rating of assembly penetrated where the following conditions exist:

1. Penetrations larger than 4 inch nominal pipe size or 16 square inches in overall cross-sectional area.

B. T-Rated Through Penetration Firestop Systems: T-ratings, in addition to F-ratings, as required according to UL 1479, where the following conditions exist:

1. Through penetrations of fire rated walls above corridor ceilings which are not part of a fire-resistive assembly.

2. Through penetrations of fire rated walls below any ceiling.

3. Penetrations larger than 4 inch nominal pipe size or 16 square inches in overall cross-sectional area.

C. Penetrations not larger than 4 inch nominal pipe size or 16 square inches in overall cross-sectional area shall have the annular space between the penetrating item and the wall/floor assembly filled with a material which will prevent passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E119 under a minimum positive pressure differential of 0.01 inch water column for the time period at least equal to the fire resistance rating of the wall/floor assembly.

D. Surface Burning: ASTM E84 with a flame spread/smoke developed rating of 25/450.

E. Firestop all interruptions and terminations of fire rated assemblies.

F. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

G. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.

H. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Provide data on product characteristics, performance and limitation criteria.

C. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

D. Certification: Submit firestopping manufacturer's certificate that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.

E. Firestopping shall be provided under a separate, standalone submittal. Firestopping shall not be included as part of any subcontractor material, product data, or shop drawing submittal package.

1.6 QUALITY ASSURANCE

A. Through penetration firestop systems to correspond to those penetration firestop system designations listed by UL in their Fire Resistance Directory.

1.7 REGULATORY REQUIREMENTS

A. Conform to CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 2 and UL requirements for fire resistance ratings and surface burning characteristics.

B. Firestopping products shall contain no detectable asbestos as determined by 40 CFR, Part 763, Subpart F, Appendix A, Section 1, Polarized Light Microscopy.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate Work under provisions of Section 01 31 00.

B. Coordinate construction of openings and penetrating items to ensure that through penetration firestop systems are installed per manufacturer's instructions and regulatory requirements.

C. Do not cover up installations that will become concealed behind other construction until authorities having jurisdiction, if required, have examined each installation.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F.

B. Maintain this minimum temperature before, during, and for 3 days after installation of materials.

C. Provide ventilation in areas to receive solvent cured materials.

2. PART 2 PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Provide firestopping components that are compatible with each other, substrates of openings, and items penetrating firestopping.

B. Provide accessories for each firestopping system that are needed to comply with designated fire-resistance-rated systems specified by firestopping manufacturer.

2.2 ACCEPTABLE MANUFACTURERS

A. AD Fire Protection Systems, Inc., www.adfire.com.

B. Hilti Construction Chemicals, Inc., www.hilti.com.

C. Minnesota Mining and Mfg. Co., www.3m.com/firestop.

D. Rector Seal Corporation, www.rectorseal.com.

E. Specified Technologies, Inc., www.stifirestop.com.

F. Tremco, www.tremcosealants.com.

G. United States Gypsum Co., www.usg.com.

H. Substitutions: Under provisions of Section 01 25 13.

2.3 FILL MATERIALS

A. Intumescent Wrap: Single-component, elastomeric sheet.

B. Vinyl Compound: Vinyl-based powder product mixed on site with water to produce a paintable compound with flame-spread and smoke-developed rating of 0 per ASTM E84.

C. Silicone Foam: Two-component, silicone based liquid elastomer that, when mixed, expands and cures in place to produce a flexible nonshrinking foam.

D. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant either in a self-leveling or non-sag grade for opening condition.

E. Fiber Stuffing: Mineral fiber stuffing with a minimum density of 3.5 lbs./cu. ft.

2.4 JOINT SEALANTS

A. Manufacturer's standard chemically curing elastomeric sealant that complies with ASTM C920.

B. Provide selections from manufacturer's full range of colors.

C. Single-Component, Neutral Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related use NT; and joint substrate related uses M, G, A, and O, as applicable to substrate assembly condition.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01 31 00.

B. Verify openings are ready to receive the work of this Section.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.

B. Remove laitance and form release agents from concrete.

C. Remove incompatible materials which may affect bond.

D. Install backing materials to arrest liquid material leakage.

3.3 APPLICATION OF THROUGH-PENETRATION FIRESTOPS

A. Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

B. Comply with through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications required.

C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce shapes and depths required to achieve fire ratings.

D. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop system.

E. Apply primer and materials in accordance with manufacturer's instructions.

F. Apply firestopping material in sufficient thickness to achieve rating.

3.4 APPLICATION OF FIRE-RESISTIVE JOINT SEALANT

A. Comply with ASTM C1193 and manufacturer's installation instructions and drawings pertaining to products and applications required.

B. Install joint fillers to provide support and at a position required to produce depth to joint widths that allow development of fire-resistance rating required.

C. Install sealant to completely fill recesses provided. Install sealant at same time as joint filler.

D. Tool non-sag sealants after application to form smooth uniform bead to configuration required to produce fire-resistance rating.

3.5 FIELD QUALITY CONTROL

A. Do not cover up installations that will become concealed behind other construction until authorities having jurisdiction if required, have examined each installation.

B. Where deficiencies are found, repair or replace firestopping to required condition.

3.6 CLEANING

A. Clean Work under provisions of Section 01 77 00.

B. Clean adjacent surfaces of firestopping materials.

3.7 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01 61 00.

B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preparing sealant substrate surfaces.

B. Sealant and backing.

1.2 SUMMARY OF SEALANT LOCATIONS

A. Joints in horizontal surfaces.

1. Expansion and isolation joints in cast-in-place concrete slabs.

2. Control and expansion joints in ceramic and quarry tile.

3. Control and expansion joints in soffits, ceilings and overhead surfaces.

4. Perimeter joints in exterior openings.

5. Joints between ceiling surfaces and frames for doors and windows.

6. Joints in flashing and sheet metal.

7. Perimeter joints of plumbing fixtures.

8. Acoustical isolation joints between head and sill of walls and floor and ceiling surfaces.

9. Joints between countertops and wall surfaces.

10. Joints in framing.

11. Joints between thresholds and floors.

12. Isolation joints in plaster soffits and ceilings.

13. Joints between dissimilar materials and those listed above.

14. Other joints as indicated.

B. Joints in vertical surfaces:

1. Expansion and isolation joints in cast-in-place concrete.

2. Expansion and isolation joints in masonry.

3. Control and expansion joints in ceramic and porcelain tile.

4. Perimeter joints in exterior openings.

5. Joints in flashing and sheet metal.

6. Perimeter joints of plumbing fixtures.

7. Acoustical isolation joints of walls.

8. Joints between cabinets and walls.

9. Joints between wall surfaces and door and window frames.

10. Joints in skylights and framing.

11. Isolation joints in plaster walls.

12. Joints between dissimilar materials and those listed above.

13. Other joints as indicated.

1.3 REFERENCES

A. ASTM C834 - Latex Sealing Compounds.

B. ASTM C919 - Practices for Use of Sealants in Acoustical Applications.

C. ASTM C920 - Elastomeric Joint Sealants.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants.

E. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

F. FS TT-S-001657 - Sealing Compound, Single Component, Butyl Rubber Based, Solvent Release Type.

G. SWRI - (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Submit product data indicating sealant chemical characteristics, performance criteria, limitations, and color availability.

C. Submit samples under provisions of Section 01 33 00.

D. Submit two samples 4 inches long in size illustrating colors selected.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittals: Manufacturer's product data for VOC content of interior sealants in compliance with Section 01 81 13.

1.6 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum five years documented experience.

B. Applicator: Company specializing in applying the Work of this Section with minimum three years documented experience, approved by sealant manufacturer.

C. Conform to Sealant, Waterproofing, and Restoration Institute (SWRI) requirements for materials and installation.

D. Perform Work in accordance with ASTM C1193.

E. Perform acoustical sealant application work to provide maximum STC values in accordance with ASTM C919.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install solvent curing sealants in enclosed building spaces.

B. Do not install sealant when temperature is less than 40 degrees F.

C. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.8 OPERATION AND MAINTENANCE DATA

A. Submit maintenance data under the provisions of Section 01 77 00.

B. Submit recommended inspection intervals for sealant joints.

C. Submit instructions for repairing and replacing failed sealant joints.

1.9 WARRANTY

A. Provide 5 year warranty under provisions of Section 01 77 00.

B. Include coverage for installed sealants and accessories which fail to achieve air and water seal and exhibit loss of adhesion or cohesion or do not cure.

2. PART 2 PRODUCTS

2.1 MATERIALS

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content limits when calculated according to South Coast Air Quality Management District (SCAQMD) Rule 1168, and must meet or exceed the requirements for the Bay Area Quality Management District Regulation 8, Rule 5.

1. Sealants: 250 g/L.

2. Sealant Primers for Nonporous Substrates: 250 g/L.

3. Sealant Primers for Porous Substrates: 775 g/L.

2.2 MANUFACTURERS

A. Manufacturers and their products are listed for each type of sealant. Acceptable manufacturers include the following:

1. Dow Consumer Solutions, www.consumer.dow.com.

2. General Electric Co., www.gesealants.com.

3. Pecora Corp., www.pecora.com.

4. Sika Corp., www.sikausa.com.

5. Tremco, Inc., www.tremcosealants.com.

6. United States Gypsum Co., www.usg.com.

7. W.R. Meadows, Inc., www.wrmeadows.com.

B. Substitutions: Under provisions of Section 01 25 13.

2.3 SEALANTS

A. Type A - Acrylic Latex: One-part, non-sag, mildew resistant acrylic emulsion compound complying with ASTM C834, Type S, Grade NS, formulated to be paintable.

1. Tremco, Inc., Acrylic Latex Caulk.

2. Pecora Corporation, AC-20.

B. Type B - Butyl Sealant: One-part, non-sag solvent-release-curing sealant complying with FS TT-S-001657 for Type 1 and formulated with a minimum of 75 percent solids.

1. Tremco, Inc., Tremco Butyl Sealant.

2. Pecora Corporation, BC-158.

3. Sonneborn, Chemrex, Multi-Purpose Sealant.

C. Type C - Silicone Sealant: One-part nonacid-curing silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25.

1. Dow Consumer Solutions, Dowsil 790.

2. General Electric Co., Silpruf.

3. Tremco, Inc., Spectrem 1.

4. Pecora Corp., 864 or 890.

5. Sonneborn/Chemrex, Omniseal.

D. Type D - Non-Sag Polyurethane Sealant: Single component sealant complying with ASTM C920, Type S, Grade NS, Class 25:

1. Pecora Corp., Dynatrol I-XL.

2. Tremco, Inc., Vulkem 921.

3. Sika Corp., Sikaflex 1a.

E. Type E - Neutral-Curing Silicone Sealant: One part medium modulus neutral-curing silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25.

1. Dow Consumer Solutions, Dowsil 795.

2. General Electric Co., Ultraglaze 4000.

3. Tremco, Inc., Spectrum 3.

4. Pecora Corp., 895.

F. Type F - One-Part Mildew-Resistant Silicone Sealant: Complying with ASTM C920, Type S, Grade NS, Class 25.

1. Dow Consumer Solutions, Dowsil 786.

2. General Electric Co., Sanitary 1700.

3. Tremco, Inc., Tremsil 200.

4. Pecora Corp., 863 or 898 White.

G. Type G - Multi-Part Pourable Sealant: Complying with ASTM C920, Type M, Grade P, Class 25. Shore A hardness +40.

1. Tremco, Inc., THC900/901.

2. Pecora Corp., Dynatred or Urexpan NR-200.

3. Sika Corporation, Sikaflex 2c NS TG.

4. W.R. Meadows, Pourthane NS/SL.

H. Type H - Acoustical Sealant: Nondrying, nonhardening permanently flexible conforming to ASTM C834.

1. Pecora Corp., AIS-919 Acoustical Sealant.

2. Tremco, Inc., Tremco Acoustical Sealant.

3. United States Gypsum Co., Sheetrock Acoustical Sealant.

2.4 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: ASTM D1056; round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joint openings are ready to receive Work and field measurements are as shown on Drawings and recommended by the manufacturer.

B. Beginning of installation means installer accepts existing substrate.

3.2 PREPARATION

A. Clean and prime joints in accordance with manufacturer's instructions. Prime if recommended by manufacturer.

B. Remove loose materials and foreign matter which might impair adhesion of sealant.

C. Verify that joint backing and release tapes are compatible with sealant.

D. Perform preparation in accordance with ASTM C1193.

E. Protect elements surrounding the Work of this Section from damage or disfiguration.

3.3 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions.

B. Measure joint dimensions and size materials to achieve required width/depth ratios.

C. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.

D. Install bond breaker where joint backing is not used.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Tool joints concave unless otherwise detailed.

3.4 CLEANING AND REPAIRING

A. Clean work under provisions of Section 01 77 00.

B. Clean adjacent soiled surfaces.

C. Repair or replace defaced or disfigured finishes caused by Work of this Section.

3.5 PROTECTION OF FINISHED WORK

A. Protect sealants until cured.

B. Sprinkler fine silica sand on sealant of exterior concrete paving joints to reduce tracking of sealant.

3.6 SCHEDULE

Type	Location	Color
Type A - Acrylic Latex Cure	All interior joints not otherwise scheduled	To match adjacent surfaces
Type B - Butyl	Under thresholds	Black
Type C - One-Part Nonacid Curing Silicone	Exterior door, entrance and window frames. Exterior and Interior vertical joints in natural colored concrete and integral colored masonry prefinished metal flashing	To match adjacent material
Type D - Non-Sag Polyurethane Sealant	Exterior door, entrance and window frames. Exterior and Interior vertical joints in painted concrete and masonry.	To match adjacent surface.
Type E - Neutral-Curing Silicone	Joints within glazed curtain wall system skylight framing system aluminum entrance system glass and glazing.	Translucent
Type F - Mildew-Resistant Silicone	Interior joints in ceramic tile and at plumbing fixtures.	White
Type	Location	Color
Type G - Multi-part Pourable Urethane	Exterior and interior joints in horizontal surfaces of concrete.	To match adjacent material
Type H - Acoustical Sealant	Interior walls between stud track/runner and adjacent construction. Between outlet boxes and gypsum board.	White

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

1. PART 1 GENERAL

1.1 WORK INCLUDED

A. Non-rated and fire rated rolled steel doors and frames.

B. Interior and exterior light frames.

C. Louvers.

1.2 REFERENCES

A. ANSI A250.8 - Recommended Specification for Standard Steel Doors and Frames.

B. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

C. ASTM A653 - Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation.

E. ASTM A924 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

F. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace.

G. CEC - California Energy Commission.

H. NFPA 80 - Fire Doors and Windows.

I. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.

J. DHI - Door and Hardware Institute.

K. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2 and Part 6.

L. UL 9 - Fire Tests of Window Assemblies.

M. UL 10C - Fire Tests of Door Assemblies.

1.3 QUALITY ASSURANCE

A. Conform to requirements of ANSI A250.8.

B. Fire rated door and frame construction to conform to UL 9 and UL 10C.

C. Installed frame and door assembly to conform to NFPA 80 for fire rated class indicated on Drawings.

D. Installed exterior frame and door assembly to be weather tight.

E. Manufacturer shall have both fabrication and assembly plant located within the continental United States or Canada. Products that are either fabricated or assembled outside the continental United States or Canada are not acceptable.

1.4 PERFORMANCE REQUIREMENTS

A. Thermal Performance: Glazed exterior borrowed lite, sidelite and transom lite frames shall have an overall minimum U-value of 0.71 as rated in accordance with the default table method approved by the California Energy Commission (CEC). Provide Certificate NRCC-ENV-05-E, from the Nonresidential Compliance Manual documenting compliance with the CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 6, Section 110, Table 110.6-A.

B. Solar Heat Gain Coefficient: Glazed exterior borrowed lite, sidelite and transom lite frames shall have an overall maximum solar heat gain coefficient of 0.73 as rated in accordance with default table method approved by the California Energy Commission (CEC). Provide Certificate NRCC-ENV-05-E, from the Nonresidential Compliance Manual documenting compliance with the CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 6, Section 110, Table 110.6-B.

1.5 REGULATORY REQUIREMENTS

A. Conform to CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 2 for fire rated frames and doors.

B. Conform to CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 6, for U-value and solar heat gain coefficient.

1.6 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00.

B. Indicate frame configuration, anchor types and spacings, location of cutouts for hardware, reinforcement, and finish.

C. Indicate door elevations, internal reinforcement, closure method, and cut outs for glazing and louvers.

D. Submit two samples of exterior frame profile at mullion intersection.

E. Submit Certificate NRCC-ENV-05-E, from the Nonresidential Compliance Manual documenting compliance with the CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 6, Section 110, Table 110.6-A and 110.6-B.

1.7 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit data for content of post-consumer and pre-consumer recycled content under provisions of Section 01 81 13.

B. LEED Submittal: Manufacturer’s product data for coatings indicating VOC content under provisions of Section 01 81 13.

C. LEED Submittal: Laboratory test results for coatings indicating requirements for low emitting materials according to Section 01 81 13.

1.8 DELIVERY, STORAGE AND PROTECTION

A. Deliver, store, protect, and handle products under provisions of Section 01 61 00.

B. Store products on site under cover.

C. Place products on at least 4 inch wood sills to prevent rust and damage.

D. Protect doors and frames with resilient packaging.

1.9 SEQUENCING AND SCHEDULING

A. Sequence Work under the provisions of Section 01 11 00.

B. Schedule Work under the provisions of Section 01 32 00.

C. Schedule delivery of all doors and frames so as not to delay progress of other trades.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Curries Mfg., Inc., www.curries.com.

B. DCI Hollow Metal, www.dcihollowmetal.com.

C. Fleming, www.flemingdoor.com.

D. Republic Builders Products Corporation, www.republicdoor.com.

E. Steelcraft, www.steelcraft.com.

F. Titan Metal Products, Inc., www.titanmetalinc.com.

G. Substitutions: Under provisions of Section 01 25 13.

2.2 DOORS AND FRAMES

A. Steel: Commercial quality cold rolled steel conforming to ASTM A653 galvanized to A60 or G60 coating class or Type B, A40 (ZF120) according to ASTM A924 with minimized spangle, mill phosphatized.

B. Provide reinforcing steel with a minimum post-consumer recycled content of 50 percent.

C. Exterior Doors: ANSI A250.8, Level 3, extra heavy-duty, Model 2, continuous welded seam, beveled edges, minimum 0.053 inch thick faces.

D. Interior Doors: ANSI A250.8, Level 2 heavy duty, Model 1, beveled edges, minimum 0.042 inch thick faces.

E. Exterior Frames: ANSI A250.8, Level 3, 0.067 inch thick material, core thickness.

F. Interior Frames: ANSI A250.8, Level 2, 0.053 inch thick material, core thickness.

2.3 DOOR CORE

A. Exterior Core: Polystyrene insulation.

B. Interior Door Core: Impregnated cardboard honeycomb.

2.4 ACCESSORIES

A. Louvers: Roll formed steel, prime coated, inverted 'Y' blade, sightproof, with countersink, tamperproof fasteners.

B. Rubber Silencers: Resilient rubber as supplied by Section 08 71 00.

C. Glazing Stops: Rolled steel channel shape, mitered corners; prepared for countersink style tamperproof screws at door installations, square butt at light frames.

D. Mineral-Fiber Insulation: ASTM C665, Type 1, without membrane facing; slag or rock wool fibers; with maximum flame spread and smoke developed indexes of 25 and 50; passing ASTM E136 for combustion characteristics.

2.5 FRAME ANCHORS

A. Masonry Anchors: Adjustable T-strap, 0.053 inch thick steel, corrugated, 2 inch x 10 inch size. Fire rated frames to have UL listed perforated strap anchor permanently anchored to frame.

B. Wood Stud Anchor: U-shaped anchor, welded to frame, 1 inch wide, 0.053 inch thick steel, with 2 pre-punched holes in nailing flange. UL listed as required for fire rating.

C. Floor Clip: Angle anchor, full width of frame, 0.067 inch thick steel.

2.6 PROTECTIVE COATINGS

A. Rubberized Coating: Corrosion proofing and sound deadener compound. Equivalent to Rust-Oleum Professional Grade Rubberized Undercoating, www.rustoleum.com.

B. Primer: Clean and treat with three stage iron phosphate process. Provide baked-on shop coat of EPA compliant gray synthetic rust - inhibitive enamel primer meeting acceptance criteria of ANSI 250.10.

C. The frame underneath the glazing stops and the inside of the glazing stop area shall be treated for maximum paint adhesion and prime painted with a rust inhibitive primer prior to installation of the frame.

2.7 HARDWARE REINFORCEMENT

A. Fabricate frames and doors with hardware reinforcement plates welded in place.

B. Hinge reinforcing shall be full width of frame profile.

C. Provide spacers for all thru-bolted hardware.

D. Reinforcement components shall be the following minimum thickness:

1. Hinge (door and frame) 3/16 inch
2. Mortise Lock or Deadbolt 0.093 inch
3. Bored Lock or Deadbolt 0.093 inch
4. Flush Bolt Front 0.093 inch
5. Surface Bolt 0.093 inch

6.	Surface Applied Closer	0.093 inch
7.	Hold Open Arm	0.093 inch
8.	Pull Plates and Bars	0.067 inch
9.	Surface Exit Device	0.093 inch
10.	Floor Checking Hinge	0.167 inch
11.	Pivot Hinge	0.167 inch

2.8 FABRICATION

A. When shipping limitations so dictate, frames for large openings shall be fabricated in sections designed for splicing.

B. All spliced joints shall occur on the interior side of exterior frames.

C. Fabricate frames as full profile welded units.

D. All face, rabbet and soffit joints between abutting members shall be continuously welded and finished smooth when exposed to exterior.

E. Corner joints shall have all contact edges closed tight, with faces mitered and continuously welded.

F. Frames with multiple openings shall have mullion members fabricated with no visible seams or joints. All face, rabbet and soffit joints between abutted members shall be continuously welded and finished smooth when exposed to exterior.

G. Provide 3/8 inch back bend return on frames where gypsum board wall material occurs whether on one or both sides.

H. Dust cover boxes or mortar guards of 0.016 inch thick steel shall be provided at all hardware mortises on frames.

I. Reinforce frames wider than 48 inches with roll formed, 0.093 inch thick steel channels fitted tightly and welded into frame head, inverted U-shape profile.

J. Prepare frame for silencers except for frames which receive weatherstripping. Provide three single rubber silencers for single doors on strike side, and two single silencers on frame head at double doors without mullions.

K. Provide steel spreader temporarily attached to feet of both jambs as a brace during shipping and handling. Spreader is not to be used for installation purposes.

L. Attach fire rated label to each frame and door unit.

M. Close top edge of exterior door flush with inverted steel channel closure. Weld all joints watertight.

2.9 MANUFACTURING TOLERANCE

A. Manufacturing tolerance shall be maintained within the following limits:

Frame width	+1/16 inch -1/32 inch
Frame height	+-3/64 inch
Frame face	+-1/32 inch
Frame stop	+-1/32 inch
Frame rabbet	+-1/64 inch
Frame depth	+-1/32 inch
Frame throat	+-1/16 inch
Door width and height	+-3/64 inch
Door thickness	+-1/16 inch
Hardware location	+-1/32 inch
Door flatness	+-1/16 inch

2.10 FINISH

A. Primer: Baked on rust-inhibitive enamel.

B. Finish: Site paint under provisions of Section 09 90 00.

C. Coat inside of frame profile with rubberized undercoating to a thickness of 1/16 inch. Coating may be factory or site applied. Do not apply coating to fire rated frames.

3. PART 3 EXECUTION

3.1 INSTALLATION

A. Install frames in accordance with ANSI/SDI A250.11.

B. Install doors in accordance with DHI.

C. Install fire doors and frames in accordance with NFPA 80.

D. Installation of exterior doors and frames to be weathertight and waterproof.

E. Seal penetration of all surface applied screws on exterior face of frames at glass stops and hardware attachments.

F. Coordinate installation with electrically controlled locks.

G. Coordinate with wall construction and details for anchor placement. Provide anchors as follows:

1. Frames up to 7'-6" height - 4 anchors each jamb.

2. Frames 7'-6" to 8'-0" height - 5 anchors each jamb. Plus an additional anchor for each 2' or fraction thereof over 8'-0".

3. Frames for Double Doors: Minimum of 2 anchors in head approximately 12 inches from each jamb.

4. Borrowed Lite Frames: 2 anchors each jamb plus 1 for each 18 inches or fraction thereof over 3'-0". Minimum 2 anchors in head and sill approximately 12 inches from each jamb plus 1 for each 30 inches of length or fraction thereof.

5. Floor anchors - 1 anchor each jamb for interior doors. Where wall construction will not allow placement of floor anchor, provide one additional jamb anchor as close to floor as possible.

6. Existing wall anchors shall be welded to provide non-removable condition. Welded bolt head to be ground, dressed and finished smooth.

H. Frames installed in masonry walls to be fully grouted with masonry grout.

I. Exposed field welds to be finished smooth and touched up.

J. Primed or painted surfaces which are scratched or marred shall be touched up.

K. Hardware to be applied in accordance with hardware manufacturer's templates and instructions.

L. Coordinate installation of glass and glazing.

M. Install door louvers.

N. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

O. Solidly pack mineral-fiber insulation into frames installed in exterior walls that are not solid grouted. For vertical and horizontal frame mullions that are inaccessible after frame assembly place insulation into frame before joining members together.

3.2 INSTALLATION TOLERANCES

A. Edge clearance for swinging doors shall not exceed the following:

Between door and frame at head and jamb	1/8 inch
Between edge of pair of doors	1/8 inch
At door sill with threshold (From bottom of door to top of threshold)	3/8 inch
At door sill with no threshold	1/2 inch
At door bottom and rigid floor covering per NFPA 80	1/2 inch
At door bottom and nominal floor covering per NFPA 80	5/8 inch

B. Frame installation tolerance shall not exceed the following:

Squareness	+-1/16 inch
Alignment	+-1/16 inch
Plumbness	+-1/16 inch
Diagonal Distortion	+-1/32 inch

END OF SECTION

SECTION 08 14 23

CLAD WOOD DOORS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Plastic faced wood doors fire rated and non-rated.

B. Door louvers.

1.2 REFERENCES

A. ANSI/WDMA - Wood Door Manufacturers Association - I.S.1-A-04-Architectural Wood Flush Doors.

B. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

C. NFPA 80 - Fire Doors and Windows.

D. NEMA LD-3 - High Pressure Decorative Laminates.

E. FSC - Forest Stewardship Council.

F. UL 10C - Fire Tests of Door Assemblies.

G. WI - Woodwork Institute: North American Architectural Woodwork Standards 3.0.

1.3 QUALITY ASSURANCE

A. Conform to requirements of the WI North American Architectural Woodwork Standards, Section 9, Premium Grade.

B. All plastic faced wood doors and their installation shall be monitored for compliance under the scope of the WI Certified Compliance Program (CCP).

C. Issue a WI Certified Compliance Certificate prior to delivery of doors certifying that doors meet all requirements of WI Grade specified.

D. After completion, issue a WI Certified Compliance Certificate for Installation.

E. Wood products shall be FSC Certified according to the rules of the Forest Stewardship Council. www.fscus.org.

F. Accredited certification bodies shall be one of the following:

1. Rainforest Alliance, www.rainforest-alliance.com.

2. SCS Global Services, www.scsglobalservices.com.

1.4 REGULATORY REQUIREMENTS

A. Conform to CBC, California Building Code for fire rated doors.

B. Fire Door Construction: Conform to UL 10C, Category A.

C. Installed Doors: Conform to NFPA 80 for fire rated class indicated.

1.5 SUBMITTALS

A. Submit shop drawings under provisions of Section 01330. Shop drawings shall bear the WI Certified Compliance Label on the first page of each set.

B. Indicate door elevations, stile and rail reinforcement, internal blocking for hardware attachment, and cutouts for glazing and louvers.

C. Submit samples under provisions of Section 01 33 00.

D. Submit two samples 12 x 12 inch in size illustrating color, finish, and texture.

E. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

1.6 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit certified wood product certificates under the provisions of Section 01 81 13.

B. Submit certified wood product evidence from vendor in the form of an invoice that contains Chain of Custody number and identification of each FSC-certified product on a line-item basis.

C. LEED Submittal: Submit manufacturer's product data under the provisions of Section 01 81 13 for composite wood products indicating that bonding agent used contains no urea formaldehyde.

D. LEED Submittal: Manufacturer’s product data for adhesives indicating VOC content under provisions of Section 01 81 13.

E. LEED Submittal: Laboratory test results for adhesives indicating requirements for low emitting materials according to Section 01 81 13.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Protect products under provisions of Section 01 61 00.

B. Package, deliver, and store doors in accordance with WI requirements as set forth in Section 2 of the WI North American Architectural Woodwork Standards.

1.8 WARRANTY

A. Provide manufacturer's standard lifetime warranty under provisions of Section 01 77 00.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Haley Architectural Doors, www.haleybros.com.

B. Oskosh Door Co., www.oshkoshdoor.com.

C. V.T. Industries, www.vtindustries.com.

D. Substitutions: Under provisions of Section 01 25 13.

2.2 DOOR CONSTRUCTION

A. Lumber Materials: FSC - Forest Stewardship Council certified sustainable harvested wood.

B. Core (Solid, Non-Rated): Solid wood block, framed block glued, or solid particle board.

C. Core (Solid, Fire Rated): Labeled fire performance type.

D. Construction; WI premium grade, ANSI/WDMA, extra heavy duty, 5 ply.

E. Vertical Edge: Plastic laminate same as door facing.

2.3 FACING

A. Plastic Laminate (Non-Rated): NEMA LD-3, special purpose type, 0.050 inch thick, color and finish selected from laminate manufacturer's entire range of products.

B. Plastic Laminate (Fire-rated): NEMA LD-3, fire-rated general purpose type, 0.050 inch thick, color and finish selected from laminate manufacturer's entire range of products.

2.4 ADHESIVES

A. WI Type I.

2.5 ACCESSORIES

A. Louvers: Model 600 A1 by Air Louvers Inc., custom special order color as selected by Architect.

B. Glass Stops: Model VLF-EZ by Air Louver Inc., custom special order color as selected by Architect.

2.6 FABRICATION

A. Fabricate non-rated doors in accordance with the WI North American Architectural Woodwork Standard, Section 9.

B. Fabricate fire rated doors in accordance with manufacturer's standard construction and labeling agency requirements.

C. Premachine doors for finish hardware.

D. For fire rated doors with mineral cores, provide solid wood blocks for hardware reinforcement at lock edge and at top of door for closer.

E. For fire rated doors with mineral cores, provide solid wood blocking for thru-bolted hardware.

3. PART 3 EXECUTION

3.1 INSTALLATION

A. Install doors in accordance with the WI North American Architectural Woodwork Standards, Section 9.

B. Conform to WI and NFPA requirements for fit tolerances.

C. Coordinate installation of glass and glazing.

D. Install door louvers.

E. Adjust doors for smooth and balanced movement.

F. Install fire doors in accordance with NFPA 80.

3.2 INSTALLATION TOLERANCES

A. Edge clearance for swinging doors shall not exceed the following as required by WI and NFPA 80:

1.	Between door and frame at head and jamb	1/8 inch
2.	Between edge of pair of doors	1/8 inch
3.	Diagonal distortion	1/8 inch
4.	At door sill with threshold. (From bottom of door to top of threshold)	3/8 inch
5.	At door sill with no threshold	1/2 inch
6.	At door bottom and rigid floor covering per NFPA 80	1/2 inch
7.	At door bottom and nominal floor covering per NFPA 80	5/8 inch

END OF SECTION

SECTION 08 31 00

ACCESS DOORS AND FRAMES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire resistive rated and non-rated access doors and frames.

B. Wall and ceiling locations.

C. Installation schedule.

1.2 REFERENCES

A. UL - Underwriters Laboratories.

1.3 QUALITY ASSURANCE

A. Manufacture fire rated access doors and frames to conform to UL requirements.

B. Provide labels indicating rating.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Include sizes, types, finishes, scheduled locations, and details of adjoining work.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Elmdor Manufacturing Co., www.elmdorstoneman.com.

B. Karp Associates Inc., www.karpinc.com.

C. J.L. Industries, www.jlindustries.com.

D. MIFAB, www.mifab.com.

E. Milcor Incorporated, www.milcorinc.com.

F. Nystrom Incorporated, www.nystrom.com.

G. Substitutions: Under provisions of Section 01 25 13.

2.2 ACCESS UNITS

A. Fire Rated Wall and Ceiling Units: Equivalent to Milcor Flush Panel Universal Fire Rated access door, Model UFR, with sandwich type door panel with 1-1/2 hour B label fire rating.

B. Non-Rated Wall Units: Equivalent to Milcor Flush Panel Style MS.

C. Non-Rated Gypsum Board Ceiling Units: Equivalent to Milcor recessed panel Style ATR.

D. Size: As required for proper access.

2.3 FABRICATION

A. Fire Rated Units: Fabricate frame of 0.0538 inch thick steel and door panels 0.0329 inch thick steel pans insulated with non-combustible filler.

B. Non-Rated Units: Fabricate frames of 0.0538 inch thick steel and door panels of 0.0329 inch thick steel.

C. Weld, fill, and grind joints to assure flush and square unit.

D. Hardware: Continuous type steel hinges with stainless steel pin, screw driver slot, quarter turn cam lock.

E. Anchors: Provide masonry anchors where required for wall construction.

2.4 FINISH

A. Prime coat units with baked on electrostatic primer.

B. Wall Unites: Stainless steel.

C. Ceiling Units: Site paint primed metal surfaces under provision of Section 09 90 00.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify rough openings for door and frame are correctly sized and located.

B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install frame plumb, level, and flush in wall and ceiling openings.

B. Position to provide convenient access to concealed work requiring access.

C. Secure rigidly in place in accordance with manufacturer's instructions.

D. Install sealant material around units as specified in Section 07 92 00.

3.3 INSTALLATION SCHEDULE

A. Provide access doors in locations and in sizes required for all mechanical, plumbing and electrical equipment for proper adjustment, maintenance and general access required by code.

END OF SECTION

SECTION 08 32 00

SLIDING GLASS DOORS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sliding doors and frames, aluminum construction.

B. Glass and glazing.

C. Operating hardware.

D. Insect screens.

1.2 REFERENCES

A. AAMA/NWWDA101 - Voluntary Specifications for Aluminum , Vinyl (PVC) and Wood Windows and Glass Doors.

B. ASTM B221 - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.

C. ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

D. ASTM E283 - Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.

E. CEC - California Energy Commission.

F. CBC - California Building Code, (CCR) California Code of Regulations, Title 24.

G. NFRC - National Fenestration Rating Council.

H. SIGMA - Sealing Insulating Glass Manufacturer's Association.

1.3 PERFORMANCE REQUIREMENTS

A. Air Leakage: Infiltration rates shall not exceed 0.3 cfm/ft squared of door area for single sliding door when tested according to The National Fenestration Rating Council's (NFRC) 400 Rating Procedure or ASTM E283 at a pressure differential of 6.24 pounds/foot squared. Provide certified test results.

B. Solar Heat Gain Coefficient (SHGC): The SHGC shall be rated in accordance with The National Fenestration Rating Councils' (NFRC) 200 Rating Procedure or in accordance with the default table method approved by the California Energy Commission (CEC). Provide certified test results.

C. Thermal Performance: Overall U-value as rated in accordance with the National Fenestration Rating Council's (NFRC) 100 Rating Procedure or in accordance with default table method approved by the California Energy Commission (CEC). Provide certified test results.

D. Limit stile deflection to 1/175 or flexure limit of glass with full recovery of glazing materials, whichever is less.

E. Design and size components to withstand dead and live loads caused by pressure and suction of wind acting normal to plane of sliding door to a positive and negative pressure as rquired by the CBC as measured in accordance with ASTM E330.

1.4 QUALITY ASSURANCE

A. Manufacturer: Company specializing in fabrication of sliding doors with five years minimum experience.

B. Fabricate door assembly in accordance with AAMA/NWWDA 101.

C. Label to be permanently affixed to frame listing certified U-value, SHGC, and air infiltration requirements of CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 6, Section 110 have been met.

D. Label to be temporarily affixed to frame certifying that U-value, SHGC, and air infiltration requirements of CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 6, Section 110 have been met.

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00.

B. Indicate on shop drawings, dimensions of units and openings, component construction and details, method for achieving air and vapor barrier seal to adjacent construction, anchorage methods and locations, hardware, and installation details.

C. Submit samples under provisions of Section 01 33 00.

D. Submit two samples illustrating typical sliding door panel corner construction, door frame corner construction, threshold profile, and finishes.

E. Submit manufacturer's certificate under provisions of Section 01 33 00 that door units meet or exceed specified requirements.

1.6 WARRANTY

A. Provide five year manufacturer's and SIGMA warranty under provisions of Section 01 77 00.

B. Warranty: Include coverage of insulated glass units from seal failure, interpane dusting or misting, and replacement of same.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. EFCO Corp., 3050 Series, www.efcocorp.com.

B. Fleetwood Aluminum Products, Inc., Fleetwood 1000 Series, www.fleetwoodusa.com.

C. Kawneer Company, Inc., 990 Series, www.kawneer.com.

D. United States Aluminum, Series 2000, www.usalum.com.

E. Substitutions: Under provisions of Section 01 25 13.

2.2 DOOR CLASSIFICATION

A. Type SGD - HC40: Comply with AAMA/NWWDA 101.

2.3 MATERIALS

A. Extruded Aluminum: ASTM B221; 6063 alloy, T5 temper.

B. Glass and Glazing Materials: Specified in Section 08 80 00.

C. Screening: 18/16 mesh, coated aluminum wire.

D. Screen Frames: Extruded aluminum formed tubular members.

E. Weatherstripping: Manufacturer's standard.

F. Anchors: Galvanized steel.

G. Bituminous Paint: Fibered asphaltic type.

2.4 HARDWARE

A. Pull Handles: Manufacturer's standard type.

B. Threshold: Extruded aluminum, sloped to exterior.

C. Bottom Rollers: Stainless steel, adjustable.

D. Limit Stops: Resilient rubber.

E. Cylinder Locks: Refer to Section 08 71 00.

2.5 SEALANT MATERIALS

A. Sealant and Backing Materials: As specified in Section 07 92 00.

2.6 FABRICATION

A. Frames: Aluminum with screw lock corner construction.

B. Fixed and Sliding Frames, Stiles, and Rails: Aluminum with screw lock corner construction.

C. Fabricate door assembly to allow for adequate clearances and shim spacing around perimeter of assemblies to enable proper installation.

D. Accurately and rigidly fit joints and corners.

E. Match components to ensure continuity of line and design.

F. Ensure joints and connections are flush, hairline, and waterproof.

G. Apply coat of bituminous paint on concealed aluminum surfaces in contact with cementitious or dissimilar materials.

H. Form sills and stools in one piece. Slope sills for wash.

I. Assemble insect screen frames of rolled aluminum rectangular sections with mesh set into frame and secured. Fit frames with adjustable roller hardware.

J. Size units to allow for tolerances of rough framed openings, clearances, and shim spacing around perimeter of assemblies.

K. Provide drainage to exterior for moisture entering joints and glazing spaces, and condensation occurring within frame construction.

L. Install glass in fixed and sliding units in accordance with manufacturer's standard method.

2.7 FINISHES

A. Organic Colored Finish: NAAMM AA-M12-C42-RIX Kynar/Hylar based fluoropolymer. Color to be selected by Architect from entire standard and custom color range.

3. PART - EXECUTION

3.1 INSPECTION

A. Verify that wall openings are ready to receive Work, and opening dimensions are as indicated on shop drawings.

B. Beginning of installation means acceptance of existing surfaces.

3.2 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction without distortion or stress.

C. Coordinate installation of loose insulation stuffing in shim spaces at frame perimeter as specified in Section 07 21 16.

D. Place threshold in bed of sealant.

E. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07 92 00.

F. Install perimeter trim and closures.

3.3 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Variation from Plumb: 1/16 inch maximum.

C. Variation from Level: 1/16 inch maximum.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 foot straight edge.

3.4 ADJUSTING

A. Adjust hardware for smooth operation.

3.5 CLEANING

A. Clean frames and glass.

B. Remove labels and visible markings.

END OF SECTION

SECTION 08 33 23

OVERHEAD COILING DOORS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Standard overhead coiling doors; electric operated; pre-finished finish.

1.2 REFERENCES

A. ASTM A480 - Flat Rolled Stainless Heat Resisting Steel Plate, Sheet, and Strip.

B. ASTM A653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron, Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM A924 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

D. UL - Underwriters' Laboratories, Inc.

E. NFPA 80 - Fire Doors and Windows.

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section01 33 00.

B. Provide pertinent dimensioning, general construction, component connections and details, anchorage methods, hardware location, and installation details.

C. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

1.4 REGULATORY REQUIREMENTS

A. Fire-Rated Door Assemblies: Shall comply with NFPA 80 and be listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing according to NFPA 252.

B. Smoke Control: In corridors and smoke barriers, doors shall be listed and labeled with the letter “S” on the fire-rating label by a qualified testing agency for smoke- and draft-control based on testing according to UL 1784. Equip each fire-rated door with smoke-seal perimeter gaskets for smoke and draft control as required for door listing and labeling.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit manufacturer's operation and maintenance data under provisions of Section 01 77 00.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - OVERHEAD COILING DOORS

A. Overhead Door Corp., www.overheaddoor.com., Model 620.

B. Raynor Worldwide, www.raynor.com., Model Dura Coil Standard.

C. Substitutions: Under provisions of Section 01 25 13.

2.2 MATERIALS - OVERHEAD COILING DOORS

A. Curtain: Minimum 0.0269 inch thick flat slats of steel, ASTM A653, Commercial Steel, Type A, G60 galvanized coating in accordance with ASTM A924; 2-1/4 inches nominal width x required length; ends of alternate slats fitted with endlocks to act as wearing surface in guides and to prevent lateral movement; bottom fitted with angles to provide reinforcement and positive contact with floor in closed position.

A. Curtain Guides: Formed steel channels and angles for required sizes and configurations.

B. Roller Shaft (Counterbalance): Steel pipe and helical steel spring system capable of producing sufficient torque to assure easy operation of curtain from any position; adjustable spring tension.

C. Housing: 0.020 inch thick galvanized steel; internally reinforced to maintain rigidity and form.

D. Weatherstripping: Water and rot proof, resilient type; located along jamb edges, bottom of curtain, and within housing.

E. Hardware: As specified in Section 08 71 00.

G. Electric Operator: UL Approved in accordance with UL 325; side mounted 115-volt, single phase 60 Hz supply to one (1) hp electric motor; adjustable friction clutch, double shoe brake system actuated by independent full line voltage solenoid controlled by motor starter; fully enclosed positive gear driven limit switch; fully enclosed magnetic cross line reversing starter.

1. Safety Devices:

a) Miller ME123 Sensing Edge

b) Miller Edge Light Curtain MLC-K72.

c) McGann Vehicle Detector.

2. Radio Controls:

a) Receiver Equivalent to Linear Model GRD. Provide remote antenna for each receiver at each door. Remote antenna to be mounted at exterior of building.

b) The transmitter shall be equivalent to Linear Model DT with three buttons. The buttons on each transmitter should operate the front and rear doors of a single apparatus bay. Verify compatibility of transmitter with automatic gate controller specified in Section 32 31 30.

c) Provide a total of 20 transmitters.

H. Auxiliary Open Limit Switch: Each door controller shall be provided with an auxiliary open limit switch.

2.3 FINISH

A. Overhead Coiling Doors: Galvanized steel factory primed and pre-finished in powder-coat paint finish in color selected by Architect.

B. Counter Service Doors: Stainless steel, No. 4 finish.

3. PART 3 EXECUTION

3.1 INSTALLATION

A. Install overhead coiling doors in accordance with manufacturer's instructions. Coordinate installation with electric service.

B. Fit, align, and adjust door assemblies level and plumb; provide smooth operation.

C. Install fire-rated doors in compliance with NFPA 80.

D. Test door closing when activated by smoke-detector fire-release system. Reset door-closing mechanism after successful test.

END OF SECTION

SECTION 08 35 00

FOUR-FOLD DOORS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Four-Fold metal doors with surface mounted tube frames.

1.2 REFERENCES

A. AISC - American Institute of Steel Construction.

B. ASTM A513/A513M - Standard Specification for Electrical-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

D. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy High-Strength Low-Alloy with improved formability and Ultra-High Strength.

E. ASTM F2200 - Standard Specification for Automated Vehicular Gate Construction.

F. UL 325 Standards.

G. ANSI 2535 - Safety Alerting Standards.

1.3 SYSTEM DESCRIPTION

A. Panels: Structural Steel Tube frame with sheet metal cladding and glass lites.

B. Surface mounted structural steel tube frames at head and jambs.

C. Operation: Overhead mounted electro-mechanical operator and safety devices.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data for each type of product specified consisting of manufacturer's technical Product Data and installation instructions for each type of door required, including data substantiating that products comply with requirements.

C. Submittal Drawings showing fabrication and installation of Four-Fold metal doors including plans, elevations, sections, details of components, hardware, operating mechanism, and attachments to the other units of Work. Include wiring diagrams for coordination with electrical trade.

1.5 QUALITY ASSURANCE

A. Doors shall be designed to withstand external or internal horizontal wind loads of 25 pounds minimum per square foot. The maximum allowable deflection shall not exceed 1/120 of the span. Fiber stresses in main members shall be limited to 27,000 pounds per square inch. Steel frames shall be designed in accordance with the AISC Steel Construction Manual

B. Door manufacturer shall have at least 10 years experience in manufacturing door type specified.

C. Door installer to be certified by manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

A. Store delivered materials and equipment in dry locations with adequate ventilation, free from dust and water, and so as to permit access for inspection and handling.

B. Handle materials carefully to prevent damage.

1.7 WARRANTY

A. Provide one year warranty under provisions of Section 01 77 00.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Door Engineering and Manufacturing, www.doorengineering.com, Model: FF300 Series: Glazed.

B. Bator Industry Doors, www.bator.com, Model: 238, Interior Mount: Fully Glazed.

C. Substitutions: Under provisions of Section 01 25 13.

2.2 MATERIALS

A. Steel Tube: ASTM A513/A513M and ASTM A500/A500M

B. Steel Sheets: Steel sheets of commercial quality, complying with ASTM A1011/A1011M hot-rolled steel sheet.

C. Hardware: Manufacturer's standard components.

D. Fasteners: Zinc-coated steel.

2.3 FOUR-FOLD DOORS

A. Construction: Door framing shall be minimum 11-gauge structural steel tube with 14-gauge steel sheet on the exterior and interior faces. Sheeting shall be formed on the vertical edges with no visible welds on the interior or exterior panel faces. All frames and framing members shall be true to dimension and square in all directions, and no door shall be bowed, warped, or out of line, in the vertical or horizontal plane of the door opening by more than 1/8 inch in 20 feet. Exposed welds and welds which interfere with the installation of various parts shall be ground smooth and flush.

B. Surface Mounted Tube Frame: Supply pre-hung tube frame system constructed of a minimum 6 inch x 4 inch x 1/4 inch tube steel, designed to anchor to masonry wall construction or weld to steel structure. All hinges, track supports and operator supports shall be factory attached.

C. Factory Finish: Door Panels and Tube Frames shall be finished with manufacturer's standard PPG Spectracron epoxy primer and polyurethane top coat. Custom color as selected by Architect.

1. Operator and operating hardware shall be powder-coated manufacturer's standard gray.

D. Hardware: Hardware shall include guide tracks and brackets, trolleys, center guides, not less than three pairs of jamb and fold hinges per opening, and all bolts, nuts, fasteners, etc. necessary for complete installation and operation.

1. All hardware, including hinges and trolleys, shall be bolted to the panel for easy removal for service or panel replacement.

2. Doors up to 16' wide and under 30psf windload shall require no floor mounted supports, guides or tracks.

3. Top tracks shall be adjustable on the end track hangers to allow for adjustment of the door panels in the open position and easily replaceable without removal of the door framing or operators.

4. Track Hood: A full width hood shall be provided to cover the exterior track and trolleys.

E. Hinges: Jamb hinges shall be dual shear and have two thrust bearings and two needle bearings. Fold hinges shall be stainless steel and be dual shear with two thrust bearings. All bearings shall be completely concealed within the hinge barrel and include grease zerks. All hinge pins shall be minimum ¾" diameter hardened steel.

F. Hinge Guards: Provide plastic guard at jamb hinges to prevent access through hinge space. Hinge guards to extend the full height of door.

G. Weatherstripping: Material shall be adjustable and readily replaceable and provide a substantially weather-tight installation. Weatherstripping at center shall be 1/16" cloth inserted neoprene and include no exposed fasteners on the exterior face of the panel. Weatherstripping at sill shall include two 1/16" cloth inserted neoprene sweeps with an aluminum retainer. The retainer shall be attached to the door with adhesive.

H. Perimeter Weatherstripping: Provide jamb and head weatherstipping of 1/16" cloth-inserted neoprene bulb (or closed cell neoprene).

I. Vision Panels: Provide 1" insulated, tempered, vision panels of the size, shape and location as noted on the drawings. Glazing tint to match tint of tempered tinted glazing specified in Section 08 80 00.

2.4 OPERATOR

A. Each Four-Fold door shall be operated by an overhead mounted electro-mechanical drive unit designed for high cycle operation. Operator consists of an electric motor, gear reducer, and rotating drive arm. The door shall be operated with connecting rods attached to the rotating drive arm on the operator and to control arms attached to the jamb door section and to the door lintel. The connecting rods shall be positive drive, keeping the door under firm control at all times. The connecting rods shall be fitted with spherical bearings and control arms shall be equipped with oil impregnated bronze bearings on polished shafts.

B. Operator shall be instantly reversible, open and close rapidly and start and stop gradually. Operator shall be adjustable to allow door to fully clear the opening. Operator shall automatically lock the door in the closed position. Operator shall be equipped with disengaging mechanism to convert to manual operation.

C. Electric motor shall be of sufficient size to operate doors under normal operating conditions at no more than 75 percent of rated capacity. The motor shall be wound for three phase 208/230/480 VAC, 60 Hertz operation.

D. Electric Controls: Controls shall be furnished by the door manufacturer and shall be complete for each door, and built in accordance with the latest NEMA standards. Incoming electrical shall be: 208V. 3 phase.

1. Control panel assemblies shall be UL listed as per NFPA70.

2. Controls shall include a programmable logic controller with digital message display or LED indicators. Controller shall include programmable close timers and programmable inputs/outputs.

3. Controls shall include a variable frequency drive(s) with independent adjustment of the opening and closing speeds.

4. Enclosures shall be NEMA 4 with disconnect switch.

5. Pushbuttons (interior) for each door shall have one (1) momentary pressure three-button push-button station marked "OPEN", "CLOSE" and "STOP". Push button enclosure shall be NEMA 4.

6. Master Control Station: Provide master control stations as indicated on the drawings, provide three push buttons for each individual door and additional button for future traffic signal control. Provide green insert buttons for “open”, red insert buttons for “stop”, and black insert button for “closing” action of the door operator. The control station shall be in a recessed NEMA type enclosure with a 1/8-inch-thick stainless steel panel face as detailed on the drawing.

7. Limit switches shall be provided to stop the travel of the door in its fully open or fully closed position.

8. Safety Edges: Provide 4-wire fail-safe electric safety edges on leading edge of all doors to reverse door upon contact with obstruction.

9. Photo eyes: Provide (1) exterior, jamb mounted, light Curtain type photo eyes, NEMA 4 rated. Photo eye shall cover from floor level to 72” above floor.

10. Presence Sensor: Provide (1) interior, overhead mounted, presence sensor with pre-open and pre-close safety fields. Sensor shall be LZR-Widescan or equal. Provide (1) exterior, overhead mounted, NEMA 4 rated presence sensor with pre-open and pre-close safety fields. Sensor shall be LZR-i30 Laser /Scanner or equal.

11. Timer Activation Loop Detectors (fire station applications): Provide “pulse on exit type” loop detector to activate auto close timer once loop has been activated and cleared, include hand/auto switch to deactivate timer. G.C. to coordinate installation of preformed loop with installer prior to exterior apron being poured. Saw cutting is not permitted.

12. Warning Horn/Strobe: Provide warning light and strobe. Include outputs PLC to allow for activation while door is in motion both opening and closing, along with activation prior to closing. Include programmable “delay-to-close” timer which activates the warning horn for a set time, prior to the door closing.

13. Radio controls:

    (a) Receiver Equivalent to Linear Model GRD. Provide remote antenna for each receiver at each door. Remote antenna to be mounted at exterior of building.

    (b) The transmitter shall be equivalent to Linear Model DT with three buttons. The buttons on each transmitter should operate the front and rear doors of a single apparatus bay. Verify compatibility of transmitter with automatic gate controller specified in Section 32 31 30.

    (c) Provide a total of 20 transmitters.

13. Wiring: Door manufacturer shall supply controls and components only. Electrical contractor shall install controls and furnish and install conduits and wiring for jobsite power and control wiring.

3. PART 3 EXECUTION

3.1 INSTALLATION

A. Install Four-Fold metal doors in strict accordance with the approved drawings. All door openings shall be completely prepared by the general contractor prior to the installation of the doors. Permanent or temporary electric wiring shall be brought to the door opening before installation is started and shall be completed so as not to delay the inspection test.

B. Doors shall be set plumb, level, and square, and with all parts properly fastened and mounted. All moving parts shall be tested and adjusted and left in good operating condition.

C. Affix permanent safety signage meeting the requirements of ANSI Z535.

3.2 ADJUSTING AND CLEANING

A. Inspection of the doors and a complete operating test will be made by the installer in the presence of the general contractor or architect as soon as the erection is complete. Any defects noted shall be corrected. After door approval in the above test, the general contractor must assume the responsibility for any damage or rough handling of the doors during construction until the building is turned over to the owner and final inspection is made.

B. Clean surfaces and repaint abraded or damaged finished surfaces to match factory-applied finish.

END OF SECTION

SECTION 08 51 13

ALUMINUM WINDOWS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Extruded aluminum windows with operating sash.

B. Glass and glazing.

C. Operating hardware and insect screens.

D. Perimeter sealant.

1.2 REFERENCES

A. AAMA 101 - Voluntary Specifications for Aluminum Prime Windows and Sliding Glass Door.

B. ASTM B221 - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.

C. ASTM E283 - Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors.

D. ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

E. ASTM E331 - Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

F. ASTM E547 - Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.

G. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 6.

H. CEC - California Energy Commission.

I. FS RR-W-365A - Wire Fabric (Insect Screening).

J. NFRC - National Fenestration Rating Council.

K. NAAMM - National Association of Architectural Metal Manufacturers.

L. SIGMA - Sealed Insulating Glass Manufacturers Association.

1.3 PERFORMANCE REQUIREMENTS

A. Comply with air infiltration, water penetration and structural performance requirements indicated in AAMA 101 for the type, grade and performance class of window units required.

B. Provide current certified AAMA test report that reflects the window configuration and type specified.

C. 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.

D. Thermal Performance: Overall U-value of as 0.63 as rated in accordance with the National Fenestration Rating Council's (NFRC) 100 Rating Procedure or in accordance with default table method approved by the California Energy Commission (CEC). Provide certified test results.

E. Air Leakage: Infiltration rates shall not exceed 0.3 cfm/ft. squared of window area when tested according to The National Fenestration Rating Council's (NFRC) 400 Rating Procedure or ASTM E283 at a pressure differential of 6.24 pounds/ft. squared. Provide certified test results.

F. 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 test results.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00.

B. Include wall opening and component dimensions; wall opening tolerances required; anchorage and fasteners; affected related work; installation requirements.

C. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

D. Submit samples under provisions of 01 33 00.

E. Submit two samples 12 x 12 inches in size illustrating window frame sections, corner section, mullion section, screen and frame.

F. Submit two samples of operating hardware.

G. Submit manufacturer's certificate under provisions of 01 33 00 that window units meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Label to be permanently affixed to frame listing certified U-value, certifying organization and rating procedure.

B. Label to be temporarily affixed to frame certifying that U-value, SHGC, and air infiltration requirements of California Building Code (CBC), California Code of Regulations (CCR), Title 24, Part 6, Section 110 have been met.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect window units under provisions of Section 01 61 00.

B. Provide wrapping or strippable coating to protect prefinished aluminum surfaces.

1.7 WARRANTY

A. Provide five year manufacturer's and SIGMA warranty under provisions of Section 01 77 00.

B. SIGMA Warranty: Include coverage of insulated glass units from seal failure, interpane dusting or misting,and replacement of same.

C. Manufacturers Warranty: Include coverage for materials and finish.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Single Hung Windows: CW-PG30-H, class, grade, type.

1. EFCO Corporation; HX32 Single Hung Series, www.efcocorp.com.

B. Substitutions: Under provisions of Section 01 25 13.

2.2 MATERIALS

A. Extruded Aluminum: ASTM B221, 6063 alloy, T5 or T6 temper.

2.3 FABRICATED COMPONENTS

A. Frames: Nominal 3-1/4 inches wide x 3-1/2 inches deep profile, of non- thermally broken, flush glass stops of snap-on type with capped sill ends.

B. Single Hung Window: Construct frame and sash using screw spline construction. Aluminum extrusion wall thickness for frame sections; 0.062 inch, sill; 0.094 inch. Locking device; Continuous interlock at meeting rail.

C. Insect Screens: FS RR-W-365A, Type VIII, woven aluminum mesh; 16/18 mesh size; fitted taut in tubular aluminum frame. Miter and reinforce frame corners; provide with manufacturer's standard retainer.

D. Operable Sash Weatherstripping: Window manufacturer's standard, permanently resilient, profiled to effect weatherseal.

E. Operable Sash Hardware: Corrosion resistant; pivot bearings; positive position stop. Provide 10 feet long pole handle for project in unit, one per room, with hanger, located as directed.

F. Fasteners: Stainless steel.

2.4 GLASS AND GLAZING MATERIALS

A. Glass and Glazing Materials: Specified in Section 08 80 00.

2.5 SEALANT MATERIALS

A. Sealant and Backing Material: As specified in Section 07 92 00.

2.6 FABRICATION

A. Fabricate windows allowing for minimum installation clearances and shim spacing around perimeter of assembly, yet enabling installation.

B. Rigidly fit joints and corners. Accurately fit and secure corners tight. Make corner joints flush, hairline, and weatherproof. Seal corner joints with sealant.

C. Develop drainage holes with moisture pattern to exterior.

D. Prepare components to receive anchor devices. Fabricate anchorage items.

E. Prepare components with internal reinforcement for operating hardware.

F. Provide internal reinforcement in mullions to maintain rigidity.

G. Shop glaze window units in accordance with manufacturer's instructions.

2.7 FINISHES

A. Organic Colored Finish: NAAMM AA-M12-C42-R1X Kynar/Hylar based fluoropolymer. Custom color as selected by Architect.

B. Apply one coat of rubberized paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials. Rust-Oleum Professional Grade Rubberized Undercoating www.rustoleum.com.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify wall openings are ready to receive Work of this Section.

B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install window frames, glass, glazing, and hardware in accordance with manufacturer's instructions.

B. Use anchorage devices to securely attach frame to structure.

C. Align window frame plumb and level, free of warp or twist. Maintain dimensional tolerances, aligning with adjacent work.

D. Pack fibrous insulation in shim spaces at perimeter to maintain continuity of thermal barrier.

E. Install sealant and backing materials as specified in Section 07 92 00.

F. Adjust operable hardware for smooth operation and tight fit of sash.

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.

END OF SECTION

SECTION 08 62 23

TUBULAR SKYLIGHTS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tubular skylights consisting of skylight dome, reflective tube, and diffuser assembly.

B. Accessories

1.2 REFERENCES

A. ASTM A463 - Standard Specification for Steel Sheet, Aluminum Coated, by the Hot Dip Process.

B. ASTM A653 - Standard Specification for Steel Sheet, Zinc Coated (Galvanized), by the Hot Dip Process.

C. ASTM A641 - Zinc-Coated (Galvanized) Carbon Steel Wire.

D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

E. ASTM D635 - Test Method for Rate of Burning and/or Extent of Time of Burning of Self-Supporting Plastics in a Horizontal Position.

F. ASTM D1929 - Test Method for Ignition Properties of Plastics.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

H. ASTM E108 - Standard Test method for Fire Tests of Roof Covering

I. ASTM E283 - Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

J. ASTM E308 - Standard Practice for Computing the Colors of Objects by Using the CIE System

K. ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls and Doors.

L. ASTM E547 - Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Cyclic Air Pressure Difference.

M. UL - Underwriters Laboratory - UL 181 - Factory Made Air Ducts and Air Connectors.

N. UL - Underwriters Laboratory - UL 790 - Standard for Tests for Fire Resistance of Roof Covering Materials.

O. ICC - International Code Council - AC-16 - Acceptance Criteria for Plastic Skylights.

1.3 PERFORMANCE REQUIREMENTS

A. Completed skylight assemblies shall be capable of meeting the following performance requirements:

1. Air Infiltration Test: Maximum 0.30 cfm/sf aperture at 1.57 psf pressure differential when tested in accordance with ASTM E283.

2. Water Resistance Test: No water leakage at 10.7 psf pressure differential with water rate of 5 gallons/hours/sf when tested in accordance with ASTM E547.

3. Uniform Load Test: No breakage, permanent damage or permanent deflection of any section at either a maximum positive load of 150 psi or negative load of 70 psf. All units shall be tested with a safety factor of three for positive pressure and two for negative pressure, acting normal to plane of roof in accordance with ASTM E330.

4. Fire Testing:

(a) Burning Brand: Class 'B' Burning Brand Test per ASTM E 108 and UL 790.

(b) Self-Ignition Temperature: Greater than 650 degrees F per ASTM D1929.

(c) Smoke Density Rating: No greater than 450 per ASTM E 84 in way intended for use.

(d) Rate of Burn: Maximum Burning Rate of 2.5 inches/min for Classification CC-2 material per ASTM D635.

(e) Rate of Burn Extent: Maximum Burn Extent of 1 inch for Classification CC-1 material per ASTM D635.

B. ICC Compliance: Comply with ICC AC-16 Acceptance Criteria for Plastic Skylights.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Installation methods.

C. Shop Drawings : Indicate layout, detail of construction and identification of materials.

D. Test Reports: Independent testing agency or evaluation service reports verifying compliance with specified performance requirements.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Provide manufacturer's documentation for daylight dimming strategies for daylighting systems.

B. LEED Submittal: Provide manufacturer's documentation for substantiation of daylighting measurements.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of tubular skylights for a minimum of 10 years.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products to site under provisions of Section 01 61 00

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8. PROJECT CONDITIONS

A. Maintain environmental conditions for temperature, humidity, and ventilation within limits recommended by manufacturer for optimum results.

B. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

A. Provide warranty under provisions of section 01 77 00.

B. Skylights: Manufacturer's standard 10 year warranty.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Solatube International, Inc., Solatube Model 750 DS - C Penetrating Ceiling, 21 inch daylighting system, ICC ESR-2253, www.solatube.com.

B. Substitutions: Under provisions of Section 01 25 13.

2.2 TUBULAR SKYLIGHTS

A. Transparent roof-mounted skylight dome and self-flashing curb, reflective tube with ceiling level diffuser assembly. All components made and assembled by one manufacturer.

B. Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube in conformance with the following:

1. Outer Roof Dome Assembly: 0.125 inch minimum thick injection molded acrylic classified as CC2 material.

2. Inner Dome Assembly: 0.115 inch thick injection modeled acrylic classified as CC1 material.

3. Low-Angled Sun Reflector: Variable prism optic molded into outer dome to capture low angle sunlight and limit high angle sunlight.

4. Roof Flashing Base: Sheet steel, one piece, seamless, leak-proof flashing functioning as base support for dome and top of tube conforming to ASTM A 653.

(a) Base Style: Type FC, curb cap, with inside dimensions of 27 inches x 27 inches to cover curb. Curb specified under Section 06 10 00.

(b) Flashing Insulator: Type C1 and CC1, thermal isolation material for use under flashing.

5. Tube Ring: 0.090 inch nominal thickness injection molded high impact PVC.

6. Dome Seal: Adhesive backed weather-strip 0.63 inch tall by 0.28 inch wide.

7. Reflective Tube: Aluminum sheet, 0.018 inch thickness.

(a) Interior Finish: Spectralight Infinity high reflectance specular finish on exposed reflective surface; specular reflectance of greater than 99 percent for visible spectrum, less than 93 percent for total solar spectrum.

(b) Color: a* and b* (defined by CIE L*a*b* color model) shall not exceed plus 2 or be less than minus 2 as determined in accordance to ASTM E 308.

(c) Tube Diameter: Approximately 21 inches.

(d) Top Tube Angle Adapter, Type TA: Reflective 45 degree adjustable top tube angle adapter, 16 inches long.

(e) Bottom Tube Angle Adapter, Type BA: Reflective 45 degree adjustable bottom tube angle adapter, 16 inches long.

(f) Top Tube Angle Adapter and Bottom Top Tube Angle Adapter Kit, Type AK: Reflective 45 degree adjustable top and bottom angle adapters, 16 inches long.

(g) Extension Tube: Reflective extension tube, Type EXX, notched for open ceiling diffuser attachment, 24 inches long.

(h) Reflective 90 Degree Adjustable Tube: Manufacturer's standard adapters for applications.

8. Diffuser Assemblies for Tubes Penetrating Ceilings: Solatube Model 750 DS-C ceiling mounted box transitioning from round tube to square ceiling assembly, supporting light transmitting surface at bottom termination of tube, with compression seal to minimize condensation and bug or dirt infiltration; 23.8 by 23.8 inches square frame to fit standard suspended ceiling grids. Transition Box: Opaque polymeric material, classified as CC2, 0.110 inch thick.

9. Lens: Type L1, Opti View Fresnel lens design to maximize light output and diffusion with extruded aluminum frame. Visible Light Transmission shall be 90 percent at 0.022 inches thick, Class CC2 material.

10. Seal: Open cell foam, acrylic adhesive backed, 0.75 inch wide by 0.125 inch thick.

11. Thermal Insulation Panel: Two climate control discs paired with polycarbonate ring.

2.3 ACCESSORIES

A. Fasteners: Same material as metals being fastened, non-magnetic steel, non-corrosive metal of type recommended by manufacturer, or injection molded nylon.

B. Sealant: Polyurethane based elastomeric sealant as recommended by manufacturer.

C. Security Bar: Type B, 0.375 inch thick stainless steel bar, across flashing diameter opening.

D. Suspension Wire: Steel, annealed, ASTM A641, Class 1 coating (galvanized), soft temper, No.12 gage size for suspension and bracing requirement.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's printed instructions and as indicated in ICC ES Report ESR-2253.

B. During installation do not leave tubes or domes in contact with combustible materials.

C. Remove protective film from tubular skylight assembly only after all parts have been installed.

D. After installation of first unit, field test to determine adequacy of installation. Conduct water test in presence of Architect or Owner's Inspector. Correct if needed before proceeding with installation of subsequent units.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hardware for doors.

B. Thresholds.

C. Gasketting.

D. Keying and key cabinet.

1.2 REFERENCES

A. ADA - Americans with Disabilities Act Standards for Accessible Design.

B. ANSI - American National Standards Institute.

C. BHMA - Builders' Hardware Manufacturers Association.

D. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

E. DHI - Door and Hardware Institute.

F. NFPA 80 - Fire Doors and Windows.

G. UL - Underwriters Laboratories.

1.3 COORDINATION

A. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.

1.4 QUALITY ASSURANCE

A. Manufacturers: Companies specializing in manufacturing door hardware with minimum five years experience. Obtain each kind of hardware from only one manufacturer.

B. Hardware Supplier: Company specializing in supplying commercial door hardware with five years documented experience.

C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.

D. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this Section.

1.5 REGULATORY REQUIREMENTS

A. Fire-Rated Openings: Comply with CBC Section 716 and NFPA Standard No. 80. Provide only hardware tested and listed by UL for the type and size of each door required, which complies with the requirements of the door and frame labels.

1. Where exit devices are required on fire-rated doors, provide supplementary marking on door UL label indicating "Fire Door to be Equipped with Fire Exit Hardware", and provide UL Label on exit device indicating "Fire Exit Hardware".

2. Exit device touchpad shall be compliant with State Fire Marshall Standard 12-10-3, Section 12-10-302.

B. Conform to applicable requirements of the Americans with Disabilities Act Standards for Accessible Design regarding accessibility requirements for door and entrance hardware.

C. Doors and doorways that are part of an accessible route shall comply with CBC Sections 11B-404.

D. The clear opening width for a door shall be 32 inches minimum. For a swinging door it shall be measured between the face of the door and the stop, with the door open 90 degrees. There shall be no projections into the opening below 34 inches and 4 inches maximum projections into the opening between 34 inches and 80 inches above the finish floor or ground. Door closers and stops shall be permitted to be 78 inches minimum above the finish floor or ground. CBC Section 11B-404.2.3.

E. Handles, pulls, latches, locks, and other operable parts on accessible doors shall comply with CBC Section 11B-309.4 and shall be operable with one hand and not require tight grasping, pinching, or twisting of the wrist. Operable parts of such hardware shall be 34 inches minimum and 44 inches maximum above the finish floor or ground. Where sliding doors are in the fully open position, operating hardware shall be exposed and usable from both sides. CBC Section 11B-404.2.7.

F. The force for pushing or pulling open a door shall be as follows: CBC Section 11B-404.2.9.

1. Interior hinged doors, sliding or folding doors, and exterior hinged doors: 5 lbs. (22.2N) maximum.

2. Required fire doors: the minimum opening force allowable by the Authority having Jurisdiction, not to exceed 15 lbs. (66.7N). These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.

3. The force required for activating any operable parts, such as lever hardware, or disengaging other devices shall be 5 lbs. (22.2N) maximum to comply with CBC Section 11B-309.4.

G. Door closing speeds shall be as follows: CBC Section 11B-404.2.8.

1. Closer shall be adjusted so that the required time to move a door from an open position of 90 degrees to a position of 12 degrees from the latch is 5 seconds minimum.

2. Spring hinges shall be adjusted so that the required time to move a door from an open position of 70 degrees to the closed position is 1.5 seconds minimum.

H. Thresholds shall comply with CBC Section 11B-404.2.5.

I. Pair of doors: Limit swing of one leaf to 90 degrees so that a clear floor space is provided beyond the arc of the swing for the wall-mounted tactile sign. CBC Section 11B-703.4.2.

1.6 SUBMITTALS

A. Submit schedule under provisions of Section 01 33 00.

B. Submit schedule at earliest possible date along with essential product data where acceptance of hardware schedule must precede fabrication of other work.

C. Organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following:

1. Type, style, function, size and finish of each hardware item. Use BHMA finish codes as per ANSI A156.18.

2. Name and manufacturer of each item.

3. Fastenings and other pertinent information.

4. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.

5. Explanation of all abbreviations, symbols, codes, etc., contained in schedule.

6. Mounting locations for hardware.

7. Door and frame sizes and materials.

D. Provide product data on specified hardware.

E. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

F. Furnish hardware templates to each fabricator of doors, frames, and other work to be factory-prepared for the installation of hardware.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 01 77 00.

B. Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site and to other Sections under provisions of Section 01 61 00.

B. Store and protect products under provisions of Section 01 61 00.

C. Package hardware items individually; label and identify package with door opening code to match hardware schedule.

D. Deliver keys to Owner by security shipment direct from hardware supplier.

1.9 WARRANTY

A. Provide five year warranty for closers, two year warranty for all other hardware under provisions of Section 01 77 00.

1.10 MAINTENANCE MATERIALS

A. Provide special wrenches and tools applicable to each different or special hardware component.

B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

Item	Manufacturer	Acceptable Substitute

Item		Manufacturer	Acceptable Substitute	
A.	Butt Hinges	Hager	McKinney	Stanley
B.	Locksets	Schlage	Corbin-Russwin	Marks
C.	Cylinders	Schlage	None	
D.	Exit Devices	Von Duprin	Corbin-Russwin	Dorma
E.	Surface Closers	LCN	Corbin-Russwin	Dorma
F.	Keypad Trim	Simplex	None	
G.	Gate Closers	Locinox	None	
H.	Gate Boxes	Keedex	None	
I.	Protection Plates	Trimco	Rockwood	Ives
J.	Stops and Holders	Trimco	Rockwood	Ives
K.	Overhead Stops	Glynn Johnson	Rixson	ABH
L.	Thresholds/Sweeps/Seals	Pemko	Reese	NGP

2.2 MATERIALS

A. Locksets: Mortise type. 16 gage curved steel, bronze or brass strikes with 2 inch deep box construction, with curved lips of sufficient length to clear trim and protect clothing.

1. Comply with requirements of local security ordinances.

2. Locks shall be of such construction that when locked, the door may be opened from within by using lever and without the use of a key or special knowledge.

3. Lock series and design: Schlage L series 03N lever.

B. Butt Hinges: Outswinging exterior doors shall have non-removable (NRP) pin. Hinge open widths shall be minimum, but of sufficient size to permit door to swing 180 degrees. Furnish hinges with stainless steel pins and ball bearings.

1. Furnish 3 hinges per leaf to 7'-5" height. Add one for each additional 2 foot height.

2. Provide 5 inch heavy weight hinges on doors over 3'-4" width.

C. Panic Hardware: Furnish exit devices with sex bolts at wood doors. Lever handle trim shall match locksets. Device shall bear UL label for fire and or panic as may be required.

1. Provide glass bead kits of proper thickness where the rail assembly of the exit device crosses a lite.

D. Surface Door Closers: Full rack and pinion type with removable non-ferrous case. Provide closers with sex bolts and grommets at wood doors. Place closers inside building, stairs, rooms, etc. Closers shall be non-handed, non-sized and adjustable. Closers shall be installed to permit door to swing 180 degrees.

1. Flush transom offset brackets shall be used where parallel arm closers are listed for doors with fixed panels over.

2. Provide drop brackets, shoe supports, and blade stop spacers as required at narrow top rails.

E. Protection Plates: Fabricate kick or mop plates with diamond plate as shown in detail 3/A-5.2. Furnish with countersunk stainless steel machine screws to match other hardware.

F. Floor Stops: Floor mounted door stops are prohibited where located in the path of travel. Where provided, install maximum 4 inches from wall surface.

G. Seals: Solid neoprene to be MIL Spec. R6855-CL III, Grade 40. Sponge neoprene to be MIL Spec. R6130, Type II, Group C. UL label shall be applied on all rated doors.

H. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occur, or for fire-resistive-rated door assemblies.

I. Thresholds: Change in level between 1/4 inch and 1/2 inch shall be beveled with a slope no greater that 1 unit vertical to 2 units horizontal (50 percent slope). The floor or landing shall not be more that 1/2 inch lower than the threshold of the doorway.

2.3 KEYING

A. Contact the Facilities Department with the City of Costa Mesa for keying requirements. Keying system shall be coordinated with the Owner and approved by Owner's representative in writing. Furnish construction key system in accordance with lock manufacturers' standard. Where interchangeable core systems are used, provide temporary cores for construction keying.

B. Key system shall be Schlage I/C core cylinder, 'E' keyway.

C. For protection of the Owner, cylinders shall be keyed at the factory of the cylinder manufacturer where permanent records are maintained. Permanently inscribe each key cylinder with number that identifies cylinder manufacturer key symbol, and notation "DO NOT DUPLICATE".

D. Deliver permanent keys and cylinder cores directly to Owner by registered security shipment direct from hardware manufacturer. Hardware supplier shall not cut keys.

2.4 KEY CABINETS

A. Key Cabinet: Sheet steel construction, .047 inch thick, piano hinged door with lock keyed to building system; manufactured by Lund Equipment Company, Bath, Ohio; or equal from Key Control System, Bechtelsvill, Pennsylvania; and Telkee, Inc., Glen Riddle, Pennsylvania. Model number as shown in schedule.

B. Cabinet Size: Size for project keys plus 10 percent growth.

C. Horizontal metal strips for keyhook labeling with plastic strip cover over paper labels.

D. Provide book index.

E. Finish: Baked enamel finish, color as selected.

2.5 LOCK BOX

A. Model No. 3200 lock box manufactured by the Knox Company, www.knoxbox.com..

B. Surface or recess mounted as required.

C. Polyester powder coated finish in black color.

D. UL listed tamper switch.

2.6 FINISHES

A. Generally to be BHMA 626 Satin Chromium.

B. Areas using BHMA 626 shall have push, pulls and kick plates of BHMA 630, Satin Stainless Steel, unless otherwise noted.

C. Factory paint door closers to match other hardware, unless otherwise noted.

D. Aluminum items to be finished AL unless otherwise noted.

2.7 FASTENERS

A. Screws for strikes, face plates and similar items shall be flathead, countersunk type; provide machine screws for metal and standard wood screws for wood.

B. Screws for butt hinges shall be flathead, countersunk, full-thread type.

C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.

D. Provide expansion anchors for attaching hardware items to concrete or masonry.

E. All exposed fasteners shall have a phillips head.

F. Finish of exposed screws to match surface finish of hardware or other adjacent work.

2.8 OTHER MATERIAL

A. All other materials not specifically described, but required for a complete and proper finish hardware installation shall be selected by Architect as required at no additional cost.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify that doors and frames are ready to receive work and dimensions are as instructed by the manufacturer.

B. Verify that power supply is available to power operated devices.

C. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Pre-Installation Meetings: Initiate and conduct with supplier, installer, and related trades, coordinate materials and techniques, and sequence complex hardware items and systems installation. Include manufacturers' representatives of locks, panic hardware, and door closers in the meetings. Convene at least one week prior to commencement of related work.

B. Install hardware in accordance with manufacturer's instructions and requirements of DHI.

C. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protection with finishing work specified in Division 9. Do not install surface-mounted items until finishes have been completed on the substrate.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Set exterior door thresholds with full-width bead of elastomeric sealant on each point of contact with floor, providing a continuous weather seal. Anchor thresholds with stainless steel countersunk screws.

G. If handle of door is changed during construction, make necessary changes in hardware at no additional cost.

H. Mount lock box in accordance with manufacturers' instructions. Connect to building security system. Mount at 4'-0" from finished grade to center of box.

3.3 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.

E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor, accompanied by the Finish Hardware Installer, shall return to the project and re-adjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.4 HARDWARE LOCATIONS

A. Lockset: 34 to 44 inches above finished floor. Verify manufacturers' template with door design.

B. Panic Device: 36 to 44 inches above finished floor. Verify manufacturers' template with door design.

C. Floor Stop: 4 inches maximum distance from any adjacent wall surface.

D. Conform to CBC, CCR, Title 24, Part 2, and ADA regarding positioning requirements for accessibility.

3.5 FIELD QUALITY CONTROL

A. Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturer's instructions and as specified herein.

3.6 SCHEDULE

A. Legend of listed manufacturers. The last column in the Schedule of Door Hardware refers to the manufacturer listed in the following schedule:

GLY	Glynn Johnson
HAG	Hager
KEE	Keedex
LCN	LCN
LOC	Locinox
LUN	Lund
PEM	Pemko
SCH	Schlage
SIM	Simplex
TRM	Trimco
VON	Von Duprin

B. The items listed in the following schedule shall conform to the requirements of the foregoing specification.

C. The Door Schedule on the Drawings indicates which hardware set is used with each door.

D. Schedule of Door Hardware:

HW-1
Each single door to have

3	HINGE	AB850 - 4.5 x 4.5 x NRP	630	HAG
1	EXIT DEVICE	AX-PA-LD-98EO	626	VON
1	KEYPAD TRIM	LP1020S	626	SIM
1	PERMANENT CORE	23-030	626	SCH
1	SURFACE CLOSER	4040XP-HEDA x ST-1944	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	FLOOR STOP	1209	626	TRM
1 SET	DOOR SEALS	2893V HEAD & JAMBS	628	PEM
1	DOOR SWEEP	57V	628	PEM
1	THRESHOLD	PER SILL DETAIL	628	PEM

Note: Install door seals before closer and rim strike
Note: Adjust exit device backset to compensate for strike jamb seal

HW-2
Each single door to have

3	HINGE	AB700 - 4.5 x 4.5	652	HAG
1	PRIVACY	L9440 x 03N x L583-363 x OS-OCC	626	SCH
1	SURFACE CLOSER	4040XP-REG	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	MOP PLATE	K0125 - 6 x 1 LDW x DIAMOND x RC	628	TRM
1	WALL BUMPER	1270WV	630	TRM
3	SILENCERS	1229A	GRY	TRM
1	THRESHOLD	QUARTZ BY OTHERS	-----	------

HW-3
Each single door to have

3	HINGE	AB750 - 4.5 x 4.5	652	HAG
1	EXIT DEVICE	AX-PA-LD-98L x 996L-03	626	VON
1	RIM CYLINDER	20-057-ICX	626	SCH
1	PERMANENT CORE	23-030	626	SCH
1	SURFACE CLOSER	4040XP-HEDA	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	KICK PLATE	K0125 - 10 x 1 LDW x DIAMOND x RC	628	TRM
1	FLOOR STOP	1214	626	TRM
3	SILENCERS	1229A	GRY	TRM

HW-4
Each single door to have

3	HINGE	AB700 - 4.5 x 4.5	652	HAG
1	LOCKSET	L9070T x 03N	626	SCH
1	PERMANENT CORE	23-030	626	SCH
1	SURFACE CLOSER	4040XP-H	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	WALL BUMPER	1270WV	630	TRM
3	SILENCERS	1229A	GRY	TRM

HW-5
Each single door to have

3	HINGE	AB700 - 4.5 x 4.5	652	HAG
1	PRIVACY	L9040 x 03N x L583-363	626	SCH

1	SURFACE CLOSER	4040XP-REG	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	OVERHEAD STOP	900S	630	GLY
1 SET	DOOR SEALS	S88 HEAD & JAMBS	DKB	PEM

HW-6
Each single door to have

3	HINGE	AB800 - 4.5 x 4.5	630	HAG
1	PRIVACY	L9040 x 03N x L583-363	626	SCH
1	INDICATOR DEADBOLT	B672 x OS-OCC x IS-LOC	626	SCH
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	MOP PLATE	K0125 - 6 x 1 LDW x DIAMOND x RC	628	TRM
1	WALL BUMPER	1270WV	630	TRM
3	SILENCERS	1229A	GRY	TRM
Note:	Install L9040 thumb-turn on Dorm side and install B672 thumb-turn on Shared Bath side			

HW-7
Each single door to have

3	HINGE	AB800 - 4.5 x 4.5	630	HAG
1	PRIVACY	L9040 x 03N x L583-363	626	SCH
1	INDICATOR DEADBOLT	B672 x OS-OCC x IS-LOC	626	SCH
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	MOP PLATE	K0125 - 6 x 1 LDW x DIAMOND x RC	628	TRM
1	OVERHEAD STOP	900S	630	GLY
3	SILENCERS	1229A	GRY	TRM
Note:	Install L9040 thumb-turn on Dorm side and install B672 thumb-turn on Shared Bath side			

HW-8
Each single door to have

3	HINGE	AB800 - 4.5 x 4.5	630	HAG
1	PRIVACY	L9040 x 03N x L583-363	626	SCH
1	INDICATOR DEADBOLT	B672 x OS-OCC x IS-LOC	626	SCH
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	FLOOR STOP	1214	626	TRM
3	SILENCERS	1229A	GRY	TRM
Note:	Install L9040 thumb-turn on Dorm side and install B672 thumb-turn on Shared Bath side			

HW-9
Each single door to have

3	HINGE	AB700 - 4.5 x 4.5	652	HAG
1	PRIVACY	L9440 x 03N x L583-363 x OS-OCC	626	SCH
1	SURFACE CLOSER	4040XP-REG	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	MOP PLATE	K0125 - 6 x 1 LDW x DIAMOND x RC	628	TRM
1	WALL BUMPER	1270WV	630	TRM
1 SET	DOOR SEALS	S88 HEAD & JAMBS	DKB	PEM
1	THRESHOLD	QUARTZ BY OTHERS	-----	------

HW-10
Each single door to have

3	HINGE	AB800 - 4.5 x 4.5 x NRP	630	HAG
1	LOCKSET	L9080T x 03N	626	SCH

1	PERMANENT CORE	23-030	626	SCH
1	CYLINDER GUARD	K-24	626	KEE
1	LOCK ASTRAGAL	5000-T	626	TRM
1	DOOR HOLDER	PAH-60 x ST-3142	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1 SET	DOOR SEALS	2893V HEAD & JAMBS	628	PEM
1	DOOR SWEEP	57V	628	PEM
1	THRESHOLD	PER SILL DETAIL	628	PEM

Note: Install door seals before holder

HW-11
Each single door to have

3	HINGE	AB750 - 4.5 x 4.5	652	HAG
1	LATCHSET	L9010 x 03N	626	SCH
1	SURFACE CLOSER	4040XP-H	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	KICK PLATE	K0125 - 10 x 1 LDW x DIAMOND x RC	628	TRM
1	WALL BUMPER	1270WV	630	TRM
1 SET	DOOR SEALS	S442 HEAD & JAMBS	DKB	PEM

HW-12
All material provided by Sliding/Sectional/Folding Door Manufacturer

HW-13
Each single door to have

3	HINGE	AB700 - 4.5 x 4.5	652	HAG
1	PRIVACY	L9040 x 03N x L583-363	626	SCH
1	SURFACE CLOSER	4040XP-REG	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	WALL BUMPER	1270WV	630	TRM
1 SET	DOOR SEALS	S88 HEAD & JAMBS	DKB	PEM

HW-14
Each single door to have

3	HINGE	AB750 - 4.5 x 4.5	652	HAG
1	EXIT DEVICE	AX-PA-LD-98L-BE x 996L-BE-03	626	VON
1	SURFACE CLOSER	4040XP-SHCUSH	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	KICK PLATE	K0125 - 10 x 1 LDW x DIAMOND x RC	628	TRM
3	SILENCERS	1229A	GRY	TRM

HW-15
Each single door to have

3	HINGE	AB750 - 4.5 x 4.5	652	HAG
1	FIRE EXIT HARDWARE	AX-PA-98EO-F	626	VON
1	KEYPAD TRIM	LP1020S	626	SIM
1	PERMANENT CORE	23-030	626	SCH
1	SURFACE CLOSER	4040XP-SCUSH	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	KICK PLATE	K0125 - 10 x 1 LDW x DIAMOND x RC	628	TRM
1 SET	DOOR SEALS	S88 HEAD & JAMBS	DKB	PEM
1	DOOR BOTTOM	234V	628	PEM
1	THRESHOLD	PER SILL DETAIL	628	PEM

HW-16
Each single door to have

3	HINGE	AB700 - 4.5 x 4.5	652	HAG
1	LOCKSET	L9070T x 03N	626	SCH
1	PERMANENT CORE	23-030	626	SCH
1	SURFACE CLOSER	4040XP-REG	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	MOP PLATE	K0125 - 6 x 1 LDW x DIAMOND x RC	628	TRM
1	WALL BUMPER	1270WV	630	TRM
1 SET	DOOR SEALS	S88 HEAD & JAMBS	DKB	PEM
1	DOOR BOTTOM	234V	628	PEM
1	THRESHOLD	PER SILL DETAIL	628	PEM

HW-17
Each single door to have

3	HINGE	AB700 - 4.5 x 4.5	652	HAG
1	LOCKSET	L9080T x 03N	626	SCH
1	PERMANENT CORE	23-030	626	SCH
1	SURFACE CLOSER	4040XP-SCUSH	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	KICK PLATE	K0125 - 10 x 1 LDW x DIAMOND x RC	628	TRM
1 SET	DOOR SEALS	S88 HEAD & JAMBS	DKB	PEM
1	DOOR BOTTOM	234V	628	PEM
1	THRESHOLD	PER SILL DETAIL	628	PEM

HW-18
Each single door to have

3	HINGE	AB750 - 4.5 x 4.5	652	HAG
1	EXIT DEVICE	AX-PA-LD-98L-BE x 996L-BE-03	626	VON
1	SURFACE CLOSER	4040XP-HEDA	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	KICK PLATE	K0125 - 10 x 1 LDW x DIAMOND x RC	628	TRM
1	WALL BUMPER	1270WV	630	TRM
3	SILENCERS	1229A	GRY	TRM

HW-19
Each single door to have

3	HINGE	AB750 - 4.5 x 4.5	652	HAG
1	LOCKSET	L9070T x 03N	626	SCH
1	PERMANENT CORE	23-030	626	SCH
1	SURFACE CLOSER	4040XP-REG	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	KICK PLATE	K0125 - 10 x 1 LDW x DIAMOND x RC	628	TRM
1	WALL BUMPER	1270WV	630	TRM
1 SET	DOOR SEALS	S88 HEAD & JAMBS	DKB	PEM
1	THRESHOLD	PER SILL DETAIL	628	PEM

HW-20
Each single door to have

3	HINGE	AB850 - 4.5 x 4.5 x NRP	630	HAG
1	EXIT DEVICE	AX-PA-LD-98EO	626	VON
1	KEYPAD TRIM	LP1020S	626	SIM
1	PERMANENT CORE	23-030	626	SCH
1	SURFACE CLOSER	4040XP-SHCUSH x ST-1595	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1 SET	DOOR SEALS	2893V HEAD & JAMBS	628	PEM
1	DOOR SWEEP	57V	628	PEM
1	THRESHOLD	PER SILL DETAIL	628	PEM

Note: Install door seals before closer and rim strike
Note: Adjust exit device backset to compensate for strike jamb seal

HW-21
Each single door to have

3	HINGE	AB700 - 4.5 x 4.5	652	HAG
1	PRIVACY	L9440 x 03N x L583-363 x OS-OCC	626	SCH
1	SURFACE CLOSER	4040XP-SCUSH	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	KICK PLATE	K0125 - 10 x 1 LDW x DIAMOND x RC	628	TRM
3	SILENCERS	1229A	GRY	TRM
1	THRESHOLD	QUARTZ BY OTHERS	-----	------

HW-22
Each single door to have

3	HINGE	AB750 - 5.0 x 4.5	652	HAG
1	LOCKSET	L9070T x 03N	626	SCH
1	PERMANENT CORE	23-030	626	SCH
1	SURFACE CLOSER	4040XP-H	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	MOP PLATE	K0125 - 6 x 1 LDW x DIAMOND x RC	628	TRM
1	WALL BUMPER	1270WV	630	TRM
1 SET	DOOR SEALS	S88 HEAD & JAMBS	DKB	PEM
1	DOOR BOTTOM	234V	628	PEM
1	THRESHOLD	PER SILL DETAIL	628	PEM

HW-23
Each single door to have

3	HINGE	AB700 - 5.0 x 4.5	652	HAG
1	LOCKSET	L9080T x 03N	626	SCH
1	PERMANENT CORE	23-030	626	SCH
1	SURFACE CLOSER	4040XP-H	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	MOP PLATE	K0125 - 6 x 1 LDW x DIAMOND x RC	628	TRM
1	WALL BUMPER	1270WV	630	TRM
1 SET	DOOR SEALS	S88 HEAD & JAMBS	DKB	PEM
1	DOOR BOTTOM	234V	628	PEM
1	THRESHOLD	PER SILL DETAIL	628	PEM

HW-24
Each pair door to have

6	HINGE	AB800 - 4.5 x 4.5 x NRP	630	HAG
2	FLUSH BOLT	3917	626	TRM
1	DUST PROOF STRIKE	3911	626	TRM
1	LOCKSET	L9080T x 03N x 7/8 STK	626	SCH
1	PERMANENT CORE	23-030	626	SCH
1	CYLINDER GUARD	K-24	626	KEE
1	SURFACE CLOSER	4040XP-SHCUSH x ST-1595	689	LCN
1	DOOR HOLDER	PAH-60 x ST-3142	689	LCN
1	ASTRAGAL	3972 x TB	600	PEM
2	KICK PLATE	K0125 - 10 x 1 LDW x DIAMOND x RC	628	TRM
1 SET	DOOR SEALS	2893V HEAD & JAMBS	628	PEM
2	DOOR SWEEP	57V	628	PEM
1	THRESHOLD	PER SILL DETAIL	628	PEM

Note: Install door seals before closer and holder

HW-25
Each single door to have

3	HINGE	AB750 - 4.5 x 4.5	652	HAG
1	KEYPAD LOCKSET	8146S	626	SIM
1	PERMANENT CORE	23-030	626	SCH
1	SURFACE CLOSER	4040XP-REG	689	LCN
1	KICK PLATE	K0125 - 10 x 2 LDW x DIAMOND x RC	628	TRM
1	KICK PLATE	K0125 - 10 x 1 LDW x DIAMOND x RC	628	TRM
1	OVERHEAD STOP	900S	630	GLY
1 SET	DOOR SEALS	S88 HEAD & JAMBS	DKB	PEM
1	THRESHOLD	PER SILL DETAIL	628	PEM

HW-SG1
All material provided by Sliding/Swinging Security Gate Manufacturer

HW-SG2
Each single gate to have

1 SET	GATE HINGE/CLOSER	MAMMOTH-HD	BLK	LOC
1	KEYPAD LOCKSET	8146S	626	SIM
1	PERMANENT CORE	23-030	626	SCH
1	LOCK ASTRAGAL	5000-T	626	TRM
1	GATE BOX	K-BXTESA-MOR	600	KEE

Note: Balance of material provided by Tube Steel Gate Manufacturer

HW-SG3
Each pair gate to have

6	HINGE	PER GATE DETAIL	-----	------
2	CANE BOLT	PER GATE DETAIL	-----	------

Note: Balance of material provided by Tube Steel Gate Manufacturer

HW-SG4
Each single gate to have

1 SET	GATE HINGE/CLOSER	MAMMOTH-HD	BLK	LOC
1	LOCKSET	L9080T x 03N	626	SCH
1	PERMANENT CORE	23-030	626	SCH
1	CYLINDER GUARD	K-24	626	KEE
1	LOCK ASTRAGAL	5000-T	626	TRM
1	GATE BOX	K-BXMOR-U	600	KEE

Note: Balance of material provided by Tube Steel Gate Manufacturer

HW-MISC
Miscellaneous Hardware

1	KEY CABINET	1201-60 CAP.	GRY	LUN
5	PADLOCK	KS43F3200	606	SCH
5	PERMANENT CORE	23-030	606	SCH
1 SET	TOOLS AND INSTRUCTIONS FOR HARDWARE ON JOB			
1 SET	CATALOG CUTS AND HARDWARE SCHEDULE FOR JOB			

END OF SECTION

SECTION 08 80 00
GLAZING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glass and glazing for hollow metal work windows and doors.

B. Mirror glass.

1.2 REFERENCES

A. ASTM C920 - Elastomeric Joint Sealants.

B. ASTM C1036 - Flat Glass.

C. ASTM C1048 - Heat-Treated Flat Glass.

D. ASTM C1651 - Measurement of Roll Wave Optical Distortion in Heat-Treated Flat Glass.

E. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

F. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

G. CPSC - Consumer Product Safety Council.

H. GANA - Glazing Manual.

1.3 QUALITY ASSURANCE

A. Conform to The Glass Association of North America (GANA) Glazing Manual and Sealant Manual for glazing installation methods.

1.4 REGULATORY REQUIREMENTS

A. Conform to all glass labeling requirements of the CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Section 2403.

1.5 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Provide data on glazing sealant. Identify colors available.

D. Submit samples under provisions of Section 01 33 00.

E. Submit two samples, 12 x 12 inches in size, illustrating each glass coloration.

F. Submit 12 inch long bead of glazing sealant in color selected.

G. Submit sealed glass unit manufacturer's certificate under provisions of Section 01 33 00 indicating units meet or exceed specified requirements.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Deliver, store and protect products under provisions of Section 01 61 00.

1.7 WARRANTY

A. Provide ten year manufacturer's warranty under provisions of Section 01 77 00.

B. Warranty: Include coverage of sealed insulating glass units from seal failure, interpane dusting or misting, and replacement of same.

C. Warranty: Include coverage for reflective coating on mirrors and replacement of same.

D. Warranty: Include coverage for delamination of laminated glass and replacement of same.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE GLASS MANUFACTURERS

A. Fire-Resistive Safety Glazing:

1. AGC Interedge Technologies, UL No. R19261, www.agc.com.

2. Nippon Electric Glass, Co., UL No. R13849, ww.neg-us.com.

3. Pilkington Glass NA, UL No. R16644, www.pilkington.com.

4. Saint-Gobain, UL No. R14515, www.vetrotech.com.

5. Technical Glass Products, UL No. R13377, www.fireglass.com.

6. SAFTI, UL No. R14212, www.safti.com.

B. Tempered Glass:

1. AGC Industries, Inc., www.agc.com.

2. Guardian Industries Corp., www.guardianglass.com.

3. Oldcastle Glass Co., www.obe.com.

4. Interpane, www.interpane.com.

5. Pilkington Glass NA, www.pilkington.com.

6. Vitro Architectural Glass, www.vitroglazings.com.

7. Zeledyne Versalux Architectural Glass, www.hartung-glass.com.

8. Viracon, Inc., www.viracon.com.

C. Sealed Insulating Glass:

1. AGC Industries, Inc., www.agc.com.

2. Guardian Industries Corp., www.guardianglass.com.

3. Interpane, www.interpane.com.

4. Oldcastle Glass Co., www.obe.com.

5. Pilkington Glass NA, www.pilkington.com.

6. Vitro Architectural Glass, www.vitroglazings.com.

7. Zeledyne Versalux Architectural Glass, www.hartung-glass.com.

8. Viracon, Inc., www.viracon.com.

D. Mirror Glass:

1. AGC Industries, Inc., www.agc.com.

2. Glasswerks, Inc., www.glasswerks.com.

3. Guardian Industries, Inc., www.guardianglass.com.

E. Substitutions: Under provisions of Section 01 25 13.

2.2 GLASS MATERIALS, GENERAL

A. Primary Glass Standard: Comply with ASTM C1036 requirements, including reference to type, class, quality, and, if applicable, form, finish, and pattern.

B. Tempered Glass Standard: Comply with ASTM C1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.

C. Sizes: Fabricate glass to sizes required for glazing openings, with edge clearances and tolerances complying with recommendations of glass manufacturer and GANA.

D. Provide thicknesses indicated or, if not indicated, as recommended by glass manufacturer for application indicated.

E. Roller wave distortion shall not exceed 0.003 inch as measured peak to valley at the center of the glass, and 0.008 inch at the leading and trailing edge of the lite of glass as measured by ASTM C1651.

2.3 PRIMARY GLASS PRODUCTS

A. Mirror Glass: ASTM C1036, Type I Transparent Glass, Flat; Class 1, Clear; q1 mirror select; 1/4 inch thick with pressure-sensitive adhesive coated scrim-impregnated film tape safety backing.

2.4 FIRE RESISTIVE GLAZING

A. Fire Resistive Glazing: Clear flat ceramic glazing sheet of 3/16 or 1/4 inch nominal thickness weighing 2.5 to 3 psf, permanently labeled with appropriate testing and inspection marks, standard polish with visible light transmission of 76.9 to 89 percent; listed by UL.Fire-Resistive Safety Glazing: 1/4 inch thick tempered or 3/8 inch thick laminated glazing unit. Unit to comply with ANSI Z97.1, CPSC 16 CFR 1201, Category II, and be listed by UL. Laminated unit to have the following characteristics:

1. First Ply: Single pane of clear, flat, fire-resistive ceramic glazing, 3/16 inch thick, standard polish.

2. Interlayer: Clear calcium silicate interlayer.

3. Second Ply: Single pane of clear, flat, fire-resistive ceramic glazing, 3/16 inch thick, standard polish.

2.5 TEMPERED GLASS PRODUCTS

A. Manufacturing Process: Horizontal (roller hearth) process with roll wave distortion parallel with bottom edge of glass as installed.

B. Clear Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type 1 (transparent glass, flat) Class 1 (clear), Quality q3 (glazing select); conforming to ANSI Z97.1 and CPSC 16 CFR 1201, Category II.

C. Clear Tempered Float Glass - Low E: ASTM C1048, Kind FT (fully tempered), Condition C (coated) with low E coating on No. 2 surface, Type 1 (transparent glass, flat) Class 1 (clear), Quality q3 (glazing select); conforming to ANSI Z97.1, and CPSC 16 CFR 1201, Category II.

D. Tinted Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type 1 (transparent glass, flat), Class 2 (tinted heat absorbing and light reducing), Quality q3 (glazing select), tint color matching non-heat treated float glass; conforming to ANSI Z97.1, and CPSC 16 CFR 1201, Category II. Tint equivalent to Solexia by Vitro Architectural Glass.

2.6 SEALED INSULATING GLASS UNITS

A. Comply with ASTM E2190, for double glazed, air filled units.

B. Nominal Thickness of Exterior Pane: 1/4 inch.

C. Nominal Thickness of Interior Pane: 1/4 inch.

D. Air Space Thickness: 1/2 inch.

E. Exterior Pane: Tinted tempered float glass.

F. Interior Pane: Clear tempered float glass.

G. Coating: Low E coating on No. 2 surface. Low E coating to be Vitro Solarban 90.

H. Spacer Material: Stainless steel warm edge spacer.

I. Dessicant: Molecular sieve or silica gel or blend of both.

2.7 GLAZING SEALANTS AND PREFORMED GLAZING TABS

A. General: Comply with ASTM C920, and sealant and glass manufacturers recommendations for suitability and compatibility.

B. One-Part Butyl Glazing Sealant:

1. Chem-Calk 300; Bostik Construction Products Div., www.bostik-findley-us.com.

2. BC 158; Pecora Corp., www.pecora.com.

C. One-Part Acid-Curing Silicone Glazing Sealant: Type S; Grade NS; Class 25:

1. Dowsil 999; Dow Consumer Solutions, www.consumer.dow.com.

2. SCS 1200; General Electric Corp., www.gesealants.com.

3. 863; Pecora Corp., www.pecora.com.

4. Omniglaze; Sonneborn Building Products Div.; ChemRex Products, Inc., www.chemrex.com.

5. Proglaze; Tremco, www.tremcosealants.com.

D. Preformed Butyl-Polyisobutylene Glazing Tape:

1. 3M Glazing Tape, 3M Corporation, www.3m.com.

2. Norseal V990 Tape: Saint-Gobain North America, www.foams.saint-gobain.com.

3. Tremco Polyshim II Tape; Tremco, Inc., www.tremcosealants.com.

4. Sika Glazing Tape, Sika Corporation, www.usa.sika.com.

2.8 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene; EPDM or silicone blocks, 80-90 Shore A durometer hardness.

B. Spacer Shims: Neoprene; EPDM or silicone blocks, Shore A durometer hardness; self adhesive one face.

C. Glazing Gasket: Resilient polyvinylchloride extruded shape to suit glazing channel retaining slot with prefabricated molded corners. Color to be selected from manufacturer's full range of colors.

D. Glazing Clips: Manufacturer's standard type.

E. Mirror Attachment Accessories: Mirror adhesive, chemically compatible with mirror coating and wall substrate. Stainless steel clips.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify surfaces of glazing channels or recesses are clean, free of obstructions, and ready for work of this Section.

B. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses.

C. Prime surfaces scheduled to receive sealant.

3.3 EXTERIOR DRY METHOD (PREFORMED GLAZING)

A. Cut glazing tape to length; install on glass pane. Seal corners by butting tape and dabbing with butyl sealant.

B. Place setting blocks at 1/4 inch points with edge block no more than 6 inches from corners.

C. Rest glass on setting blocks and push against fixed stop with sufficient pressure to attain full contact at perimeter of pane.

D. Install removable stops without displacement of glazing gasket. Exert pressure for full continuous contact.

E. Trim protruding tape edge.

F. Use for all aluminum windows and aluminum framed storefronts.

3.4 EXTERIOR COMBINATION METHOD (TAPE AND SEALANT)

A. Cut glazing tape to length and set against permanent stops, 3/16 inch below sightline. Seal corners by butting tape and dabbing with butyl sealant.

B. Apply heel bed of butyl sealant along intersection of removable stop with frame ensuring full seal between glass and frame.

C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

D. Rest glass on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane.

E. Install removable stops with spacer strips inserted between glass, and applied stops at 24 inch intervals, 1/4 inch below sightline.

F. Fill gap between pane and removable stop with silicone sealant to depth equal to bite of frame on pane, but not more than 3/8 inch below sightline.

G. Apply cap bead of silicone sealant along exterior void, to uniform line, flush with sightline. Tool or wipe sealant surface with solvent for smooth appearance.

H. Use for all exterior steel frames.

3.5 INTERIOR - DRY METHOD (TAPE AND TAPE)

A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.

B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

D. Place glazing tape on free perimeter of glazing in same manner described above.

E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

F. Knife trim protruding tape.

G. Use for all interior steel frames.

3.6 INSTALLATION - MIRRORS

A. Set mirrors with adhesive, applied in accordance with adhesive manufacturer's instructions.

B. Place plumb and level.

3.7 CLEANING

A. After installation, mark pane with an "X" by using plastic tape or removable paste.

B. Remove glazing materials from finish surfaces.

C. Remove labels after Work is completed.

END OF SECTION

SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

1. PART 1 GENERAL

1.1 WORK INCLUDED

A. Gypsum board.

B. Glass tile backer board.

C. Abuse/impact resistant gypsum board.

D. Acoustically enhanced gypsum board.

E. Taped and sanded joint treatment.

F. Surface primer.

G. Resilient furring channels.

1.2 REFERENCES

A. ASTM C11 - Standard Terminology Relating to Gypsum and Related Building Materials and Systems.

B. ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.

C. ASTM C557 - Adhesives for Fastening Gypsum Wallboard to Wood Framing.

D. ASTM C840 - Application and Finishing of Gypsum Board.

E. ASTM C919 - Use of Sealants in Acoustical Applications.

F. ASTM C1002 - Steel Drill Screws for the Application of Gypsum Board.

G. ASTM C1178 - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.

H. ASTM C1396 - Standard Specification for Gypsum Board.

I. ASTM C1629 - Standard Specification for the Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.

J. ASTM D226 - Asphalt-Saturated Felt Used in Roofing and Waterproofing.

K. ASTM D1037 - Test Methods for Evaluating Properties of Wood-Based Fiber and Particle Panel Materials.

L. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

M. ASTM D3274 - Standard Test Method for Evaluating Degree of Surface Disfiguration of Paint Films in Fungal or Algal Growth, or Soil and Dirt Acumulation.

N. ASTM D4977 - Standard Test Method for Granular Adhesion to Mineral Surfaced Roofing by abrasion (modified).

O. ASTM D5420 - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).

P. ASTM E90 - Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.

Q. ASTM E695 - Standard Method of Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading.

R. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

S. GA 201 - Using Gypsum Board for Walls and Ceilings.

T. GA 214 - Levels of Gypsum Board Finish.

U. GA 216 - Application and Finishing of Gypsum Board.

V. GA 600 - Fire Resistance Design Manual.

W. ISO 14040 - Environmental Management - Life cycle assessment - Principals and Framework.

X. UL - Underwriters Laboratories.

1.3 QUALITY ASSURANCE

A. Applicator: Company specializing in gypsum board systems work with five years documented experience.

1.4 REGULATORY REQUIREMENTS

A. Conform to CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Chapter 7, and UL and GA requirements for fire rated assemblies as indicated on the drawings

B. Conform to UL No. 2079 for cyclical design at head of fire rated walls.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit manufacturer's product data for adhesives and sealants, including printed statement of VOC content, under the provisions of Section 01 81 13.

B. LEED Submittal: ISO 14040 Environmental Management, Life Cycle Assessment, Principals and Framework:

1. Carbon emissions limit per Gypsum Association; Industry Standard Type III EPD for North America, type X wallboard with a manufacturing Global4 Warming Potential of 225kg CO_2/1000 ft^2.

2. Water reduction per Gypsum Association; Industry Standard Type III EPD for North American type x wall board having a manufactured Virtual Water of: 1.0 m^3 / 1000 ft^2.

1. Primary energy rom non-renewable resources: 3997 MJ / 1000 ft^3.

C. LEED Submittal: Submit data for content of post-consumer and pre-consumer recycled content under provisions of Section 01 81 13.

D. LEED Submittal: Manufacturer's product data for coatings indicating VOC content under provisions of Section 01 81 13.

E. LEED Submittal: Laboratory test results for coatings indicating requirements for low emitting materials according to Section 01 81 13.

F. LEED Submittal: Manufacturer's product data for adhesives indicating VOC content under provisions of Section 01 81 13.

G. LEED Submittal: Laboratory test results for adhesives indicating requirements for low emitting materials according to Section 01 81 13.

H. LEED Submittal: Submit Environmental Product Declaration for each product under provisions of Section 01 81 13.

I. LEED Submittal: Submit Health Product Declaration for each product under provisions of Section 01 81 13.

J. LEED Submittal: Sourcing of Raw Materials; Submit Corporate Sustainability Report for each manufacturer under provisions of Section 01 81 13.

1.6 ACOUSTICAL PERFORMANCE

A. Acoustical Attenuation for Identified Interior Partitions: 50 STC in accordance with ASTM E90.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain uniform temperature of minimum 60 degrees F and humidity of 30 to 50 percent prior to, during, and after installation of the Work of this Section.

1.8 DEFINITIONS

A. Refer to ASTM C11 for definitions of terms related to gypsum board assemblies.

1.9 FIELD SAMPLES

A. Provide field samples under provisions of Section 01 33 00.

B. On wall and ceiling surface duplicate specified texture finish on at least 100 sq.ft. of surface area.

C. Provide complete finish including surface primer.

D. Simulate finished lighting conditions for review of field sample.

E. After surface texture is accepted, the accepted surface will remain as part of the Work and will be used to evaluate subsequent applications of finish texture.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - GYPSUM BOARD SYSTEM

A. American Gypsum Corp., www.americangypsum.com.

B. Certainteed, www.certainteed.com.

C. Georgia Pacific Corp., www.gp.com.

D. National Gypsum Co., www.nationalgypsum.com.

E. PABCO Gypsum, www.pabcogypsum.com.

F. United States Gypsum Co., www.usg.com.

G. Substitutions: Under provisions of Section 01 25 13.

2.2 FRAMING MATERIALS

A. Metal Furring: ASTM C645, hat-shaped, 7/8 inch deep, 0.0329 inch thick.

B. Resilient Furring Channel: Manufacturer's standard product designed to reduce sound transmission, complying with ASTM C645 for material, finish and widths of face and fastening flange; 1/2 inch deep x 0.0179 inch thick asymmetric-shaped channel with face connected to single flange by slotted leg (web).

C. Furring Channel: ASTM C754, 1-1/2 inch x 0.475 lb./ft. channel.

D. Fasteners: ASTM C1002.

E. Adhesive: ASTM C557.

2.3 GYPSUM BOARD MATERIALS

A. Fire Rated Gypsum Board: ASTM C1396; fire resistive type, UL rated; 5/8 inch thick unless otherwise indicated, maximum permissible length; ends square cut, tapered and beveled edges. Similar to Sheetrock Brand EcoSmart Panels manufactured by United States Gypsum Company

B. Fire Rated Gypsum Tile Backer Board: ASTM C1178; fire resistive type, UL rated 5/8 inches thick unless otherwise indicated, maximum length; ends square cut, tapered and beveled edges. Wet resistant, embedded glass reinforced gypsum meeting ASTM D3273, with a score of 10 as rated according to ASTM D3274. Equivalent to Diamondback Tile Backer manufactured by CertainTeed.

C. Mold and Mildew Resistant Gypsum Board: ASTM C1396; 5/8 inches thick unless otherwise indicated, maximum length; ends square cut, tapered and beveled edges. Mold and mildew resistant core and paper facing, meeting ASTM D3273, with a score of 10 as rated according to ASTM D3274. Similar to Sheetrock Brand EcoSmart Mold Tough Panels manufactured by United States Gypsum Company.

D. Fire Rated Moisture Resistant Gypsum Board: ASTM C1396; fire resistive type, UL rated; 5/8inch thick unless otherwise indicated; water resistant core; water resistant paper on front, back and long edges; maximum permissible length; ends square cut, tapered and beveled edges.

E. Fire Rated Acoustically Enhanced Gypsum Board: ASTM C1396: fire resistive type, UL rated; 5/8 inch thick multilayer product constructed of two layers of gypsum board sandwiching a viscoelastic sound-absorbing polymer core; maximum permissible length; ends square cut, tapered and beveled edges, similar to Sound Break as manufactured by National Gypsum Company.

F. Fire Rated Impact Resistant Gypsum Board: ASTM C1629; fire resistive type, UL rated; 5/8 inch thick, maximum permissible lengths; ends square cut, tapered and beveled edges; with additives and fiberglass mat facings to enhance indentation resistance, abrasion, and impact resistance. Similar to Sheetrock Brand VHI Firecode X Panels manufactured by United States Gypsum Company meeting the following characteristics:

1. Surface Abrasion: ASTM C1629 / D 4977, Level 2.

2. Indentation Resistance: ASTM C1629 / D5420, Level 1.

3. Soft-Body Impact: ASTM C1629 / E695, Level 3.

4. Hard-Body Impact: ASTM C1629 / Annex A1, Level 2.

5. Mold / Mildew Resistance: ASTM D3273, with a score of 10.

G. Fire Rated Flexible Gypsum Board: ASTM C1396; fire resistive type, UL rated, 1/4 inch thick, maximum permissible lengths; ends square cut, slightly tapered edges.

2.4 ACCESSORIES

A. Acoustical Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board: As specified in Section 07 92 00.

B. Fire Rated Sealant and Fiber Stuffing: As specified in Section 07 84 00.

C. Corner Beads: Metal, hot dip galvanized.

D. Edge Trim: GA 201 and GA 216; Type LC bead, unless otherwise indicated.

E. Control Joints: Roll-formed zinc, Type USG No. 093.

F. Aluminum Trim and Reveal Moldings: Extruded accessories of profiles and dimensions indicated. Alloy 6063-T5, clear anodic finish. Similar to products manufactured by Fry Reglet Co., www.fryreglet.com.

G. Curved-Edge Cornerbead: Vinyl type with notched or flexible flanges.

H. Spot Grout: ASTM C475, setting-type joint compound.

I. Joint Materials Interior: ASTM C475; reinforcing tape, joint compound, adhesive, water, and fasteners. Use tapes and compound recommended by gypsum board manufacturer for the use intended. Use ready mixed, drying type compounds. Use taping compound for embedding tape and first coat over fasteners and flanges of corner beads and trim. Use topping compound for fill and finish coats.

J. Primer: Flat latex basecoat paint equivalent to First Coat manufactured by United States Gypsum Company.

K. Primer-Surfacer: Not permitted.

L. Membrane: ASTM D226; No. 15 asphalt saturated roofing felt.

M. Attic Access Doors: Glass fiber reinforced stealth access panel by HS Fire Safety Products, www. hallman-sales.com. Minimum 30 inch x 30 inch door size, locations and quantities as indicated on the drawings.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify that site conditions are ready to receive Work.

B. Beginning of installation means acceptance of substrate.

3.2 ACOUSTICAL ACCESSORIES INSTALLATION

A. Locate nested joints over framing members.

B. Install acoustical sealant within partitions in accordance with manufacturer's instructions and ASTM C919.

C. Seal perimeter, joints, openings and penetrations on each face of partition.

3.3 MEMBRANE INSTALLATION

A. Install membrane over wall studding where moisture resistant gypsum board is to be installed.

B. Install membrane over substrate; weatherlap horizontal edges 4 inches and vertical edges 6 inches.

3.4 GYPSUM BOARD INSTALLATION

A. Install gypsum board in accordance with ASTM C840 and manufacturer's instructions.

B. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing except those ends and edges which are perpendicular to framing members. Comply with required UL, CBC, or GA fire rated assembly.

C. Erect double layer gypsum board with standard gypsum board for first layer placed in most economical direction with second layer placed parallel to face layer with adhesive and supplementary fasteners. Off-set joints of second layer from joints of first layer by at least 12 inches.

D. Erect double layer fire rated gypsum board in accordance with required UL, CBC, or GA fire rated assembly.

E. Use screws when fastening gypsum board to wood furring or framing except where nails are required for UL or UBC fire rated assembly.

F. Install fire stop sealant and fiber stuffing at wall penetrations and terminations in accordance with required UL, CBC, or GA fire rated assembly in accordance with Section 07 84 00.

G. Install acoustical sealant at wall penetrations and terminations as specified in this section and in accordance with Section 07 92 00.

H. Isolate perimeter of gypsum board applied to non-load bearing partitions at structural abutments. Provide ½ inch wide space and trim with metal edge. Seal joint between metal edge and structural surface with acoustical sealant.

I. Where partitions intersect structural members projecting below underside of floor / roof slabs and decks, cut gypsum panels to fit profile formed by structural member. Allow ½ inch wide space and install acoustical sealant.

J. Treat cut edges and holes in moisture resistant gypsum board with sealant.

K. Place control joints as indicated on the drawings. Provide adequate seal or safing insulation behind control joints to maintain sound or fire ratings.

L. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

M. Spot grout metal door frames. Apply spot grout at each jamb anchor clip just before inserting board into frame.

3.5 CURVED PARTITIONS

A. Install panels horizontally and unbroken across curved surface.

B. Wet gypsum panels on surface that will become compressed.

C. On convex side of partition, begin installation at one end of curved surface and fasten panels to studs as they are wrapped around curve.

D. On concave side of partition, start fastening panels at center of curve and work outward to panel ends.

E. Allow wetted panels to dry before applying joint treatment.

3.6 JOINT TREATMENT

A. Tape, fill, and sand joints, edges, and corners in accordance with GA-214.

B. Feather successive coats a minimum of 2 inches onto adjoining surfaces for each coat.

C. Where fire resistance rating is required, detail of joint treatment shall meet fire rating requirement.

D. Level 1 Treatment:

1. All joints and angles shall have tape embedded in joint compound.

2. Surface shall be free of excess joint compound.

3. Tool marks and ridges are acceptable.

4. Use for plenum areas above ceiling, in areas that are generally concealed and other areas not normally open to view.

E. Level 2 Treatment:

1. All joints and angles shall have tape embedded in joint compound and one separate coat of joint compound shall be applied over all fastener heads and accessories.

2. Surface shall be free of excess joint compound.

3. Tool marks and ridges are acceptable.

4. Use where surface is substrate to ceramic tile, acoustic tile, or tackable wallboard system.

F. Level 5 Treatment:

1. All joints and angles shall have tape embedded in joint compound with three separate coats of topping compound applied over all joints, fasteners, and accessories.

2. Apply two thin skim coats of topping compound over entire surface.

3. All compound shall be smooth and free of tool marks and ridges.

4. Sand lightly between coats.

5. Use for all surfaces that are scheduled to receive a painted finish.

3.7 FINISHING

A. Roller apply surface primer to all gypsum board surfaces scheduled to receive a painted and textured finish prior to application of paint or texture finish.

B. Remove any overspray of texture finish from door frames, windows, and other adjoining construction.

3.8 TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction.

3.9 RECYCLING CONSTRUCTION WASTE

A. Recycle gypsum board waste under the provisions of Section 01 74 19.

3.10 PROTECTION

A. Protect adjacent surfaces from joint compound. Promptly remove from floors and other surfaces. Repair stained and marred surfaces damaged during gypsum board application.

B. Protect work of this section from weather, condensation, direct sunlight, and other detrimental causes during the construction period.

C. Remove and replace gypsum panels that become wet, moisture damaged and mold damaged.

END OF SECTION

SECTION 09 24 00

CEMENT PLASTERING

1. PART 1 GENERAL

1.1 WORK INCLUDED

A. Metal lathing.

B. Portland cement plaster system.

C. Acrylic based finish coat.

D. Plaster application schedule.

1.2 REFERENCES

A. ASTM A641 - Zinc-Coated (Galvanized) Carbon Steel Wire.

B. ASTM C150 - Portland Cement.

C. ASTM C206 - Finishing Hydrated Lime.

D. ASTM C847 - Standard Specifications for Metal Lath.

E. ASTM C897 - Aggregate for Job-Mixed Portland Cement-Based Plasters.

F. ASTM C926 - Application of Portland Cement-Based Plaster.

G. ASTM C932 - Surface-Applied Bonding Agents for Exterior Plaster.

H. ASTM C933 - Welded Wire Lath.

I. ASTM C954 - Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs from 0.033 inches to 0.112 inches in thickness.

J. ASTM C1002 - Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.

K. ASTM C1063 - Installation of Lathing and Furring for Portland Cement Based Plaster.

L. NAAMM Standard ML/SFA 920 - Guide Specifications for Metal Lathing and Furring.

M. Lathing and Plaster Systems Manual - Third Edition.

N. Military Specification MIL-B-19235 - Boding Agents.

O. PCA (Portland Cement Association) - Portland Cement Plaster (Stucco) Manual.

P. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

Q. IAPMO - International Association of Plumbing and Mechanical Officials, Uniform Evaluation Service (UES) Reports.

R. ICC - International Code Council.

S. TSIB - Technical Services Information Bureau.

1.3 QUALITY ASSURANCE

A. Applicator: Company specializing in cement plaster work with five years documented experience.

B. At the completion of lathing and prior to the application of scratch coat of plaster, contact the Technical Services Information Bureau, www.tsib.org, and arrange for inspection of lathing and accessories installation. Provide Architect a written report of the results of the inspection.

C. Installation of underlayment and shall be in accordance with manufacturer's installation guidelines and recommendations. Provide site reports from manufacturer's field service representative, indicating observation of underlayment installation.

1.4 REGULATORY REQUIREMENTS

A. Conform to CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Chapter 7, for fire rated assemblies as indicated on drawings.

B. Conform to CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Chapter 25 for materials and their installation.

C. Obtain approval of enforcement agency for installation of self furring metal lath.

1.5 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Provide product data on plaster materials, characteristics and limitations of products specified.

C. Submit samples of texture and finish coat color for plaster finish.

D. Provide underlayment manufacturer's written installation instructions.

1.6 FIELD SAMPLES

A. Provide sample panel under provisions of Section 01 33 00.

B. Construct field sample panel, minimum 96 inches long by 96 inches wide, illustrating lath installation, base coat installation, surface texture, and color of finish coat.

C. Locate where directed.

D. Accepted sample may remain as part of the Work.

1.7 PRE-INSTALLATION CONFERENCE

A. Convene a conference two weeks prior to commencing work of this Section under the provisions of Section 01 31 00.

B. Require the attendance of parties directly affecting the Work of this Section.

C. Review requirements for installation of all materials specified in this Section for sequencing, proper installation, integration and protection.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not apply plaster when substrate or ambient air temperature is less than 40 degrees F or more than 90 degrees F.

B. Maintain minimum ambient temperature of 40 degrees F during and after installation of plaster.

C. Protect portland cement plaster from uneven and excessive evaporation during dry weather and from strong blasts of dry air.

1.9 WARRANTY

A. Provide ten year warranty for underlayment and flashings under provisions of Section 01 77 00

B. Warranty: Include coverage for published water infiltration properties of underlayment and flashings installed for exterior walls and openings.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Lathing Materials:

1. Amico-West, www.amico-lath.com.

2. ClarkDietrich Building Systems, www.clarkdietrich.com.

3. CEMCO, www.cemcosteel.com.

4. Structa Wire Corp., www.structawire.com.

B. Accessories:

1. ClarkDietrich Building Systems, www.clarkdietrich.com.

2. Flannery, Inc., www.flannerytrim.com.

3. Fry Reglet Corp., www.fryreglet.com.

4. Metalex Corp., www.metlx.com.

5. CEMCO, www.cemcosteel.com.

6. Amico-West, www.amico-lath.com.

7. Stockton Wire Products, www.stocktonproducts.com.

8. Structa Wire Corp., www.structawire.com.

C. Acrylic-Based Finish Coat:

1. BASF, Master Builders, Master Protect HB 400 Acrylic Finish, www.master-builders-solutions.basf.us.com.

2. Dryvit Systems DPR: Modified Textured Acrylic Finish, www.dryvit.com.

3. Omega Stucco, Akrolastic, www.omega-products.com.

4. Senergy, Inc., Senerlastic Plus Acrylic Finish, www.senergy.cc.

5. Sto Industries, StoLit, www.stocorp.com.

D. Underlayment:

1. Underlayment: Tyvek as manufactured by E.I. DuPont de Nemours, www.tyvek.com

(a) First layer: Commercial Wrap D.

(b) Second layer: Commercial Wrap.

2. Other acceptable underlayment: Dryline Building Wrap CP and Rain Drain as manufactured by National Shelter Products, Inc., www.drylinewrap.com.

E. Substitutions: Under provisions of Section 01 25 13.

2.2 PLASTER BASE COAT MATERIALS

A. Cement: ASTM C150, Normal - Type I, Portland.

B. Lime: ASTM C206, Type S.

C. Aggregate: In accordance with ASTM C897 and PCA Plaster (Stucco) Manual.

D. Water: Clean, fresh, potable and free of mineral or organic matter which can affect plaster.

E. Bonding Agent: ASTM C932; type recommended for bonding plaster to concrete and concrete masonry surfaces. Larsen Products Corp. - Weld-Crete, www.larsenbuildingproducts.com.

F. Plaster Mix Reinforcement: Glass fibers, 1/2 inch nominal length, alkali resistant.

G. Substitutions: Under provisions of Section 01 25 13.

2.3 PLASTER FINISH COAT MATERIALS

A. Acrylic Finish Coat: Factory-mixed formulation of acrylic emulsion, colorfast mineral pigments and fine aggregates for use over portland cement plaster base coats. Integral pre-mixed color from manufacturer's entire range color selection.

2.4 METAL LATHING

A. Metal Lath for Vertical Surfaces: ASTM C847, 3.4 lb/sq.yd. expanded metal, galvanized, self furring type with “V” shaped continuous groove or self-furring welded wire lath, ASTM C933 1.95 lb/sq. yd. galvanized according to ASTM A641 equal to Mega Lath as manufactured by Structa Wire Corp., IAPMO UES Report No. 2017.

B. Metal Lath for Horizontal Surfaces: ASTM C847, 3.4 lb./sq.yd. expanded metal, galvanized, with factory applied kraft paper backing or self-furring welded wire lath, ASTM C933 1.95 lb/sq. yd. galvanized according to ASTM A641, with factory applied kraft paper equal to Mega Lath as manufactured by Structa Wire Corp., IAPMO UES Report No. 2017.

2.5 ACCESSORIES

A. Corner Mesh: Formed steel, minimum 0.0179 inch thick; expanded flanges shaped to permit complete embedding in plaster; minimum 2 inches wide; galvanized finish. Equivalent to ClarkDietrich, CEMCO, or Cornerite.

B. Corner Reinforcement: Equivalent to Western Metal, 0.0179 inch Stucco-Lok or 18 gage Stockton Corneraid for straight corners. Stockton Bullnose Regular for rounded corners, galvanized finish.

C. Strip Mesh: Metal lath, 3.4 lb/sq. yd. expanded metal, galvanized, 6 inches wide x 18 inches long.

D. Vent Screed: Equivalent to Stockton SVR, minimum 0.0179 inch thick; depth governed by plaster thickness, minimum 4 inch width, double "V" profile with perforated expanse between "V's" of longest possible lengths; galvanized finish.

E. Casing Bead: Formed steel; minimum 0.0179 inch thick; thickness governed by plaster thickness; maximum possible lengths; with square edges; galvanized finish.

F. Curved Casing Bead: Square-edged style fabricated from aluminum, preformed into curve or radius indicated.

G. Weep Screed: Equivalent to Stockton W-S#7, minimum 0.0179 inch thick; depth governed by plaster thickness, minimum 3-1/2 inch high flange, "V" shaped, of longest possible lengths; galvanized finish.

H. Drip Screed: Equivalent to Stockton SDC or BSS No. 10 drip mould as indicated on drawings, minimum 0.0179 inch thick; depth governed by plaster thickness, minimum 3-1/2 inch high flange, of longest possible lengths; galvanized finish.

I. Window/Door Drip Screed: Equivalent to Stockton WTP, minimum 0.0179 inch thick; depth governed by plaster thickness, minimum 3-1/2 inch high flange, of longest possible lengths; galvanized finish.

J. Control and Expansion Joints: Equivalent to Western XJ 15-3, depth to conform to plaster thickness, maximum practical lengths, galvanized finish.

K. Single Point Screed: Equivalent to Stockton PBS, minimum 0.0179 inch thick; depth governed by plaster thickness, maximum practical lengths; galvanized finish.

L. Interior Corner Joints: Equivalent to Western No. 30, depth to conform to plaster thickness, maximum practical lengths, galvanized finish.

M. Anchorages: Nails, staples, or other approved metal supports, of type and size to suit application, galvanized to rigidly secure lath and associated metal accessories in place.

N. Screws: ASTM C954 or ASTM C1002, self drilling.

O. Penetration Flashing: Tyvek flashing system. Straight flash for jambs, FlexWrap for heads and sills. Equivalent as manufactured by The Polymer Group, Inc. or National Shelter Products, Inc.

P. Polyethylene Sheet: Clear, 6 mil thick.

Q. Wire: ASTM A641, Class 1 coating (galvanized), soft temper.

R. Powder Activated Fastener: 0.157 inch diameter X-U premium nail with washer as manufactured by Hilti, Inc., www.us.hilti.com, ICC/ES Report No. ESR-2269.

S. Tape: Acrylic adhesive backed oriented polypropylene, 3 inch in width.

2.6 CEMENT PLASTER MIXES

A. Mix and proportion cement plaster in accordance with ASTM C926 and PCA Plaster (Stucco) Manual.

B. Scratch Coat and Brown Coat: One part cement, minimum 3-1/2 and maximum 5 parts aggregate, and 0-3/4 parts hydrated lime. Alkali resistant glass fibers at a rate of 1 lb. per sack of cement. When expanded lath is used fibers shall only be used in brown coat. When welded wire lath is used, fibers shall be used in both scratch and brown coat.

C. Acrylic-Based Finish Coat: Factory packaged; comply with finish coat manufacturer's directions.

C. Mix only as much plaster as can be used in 1 hour.

D. Mix materials dry, to uniform color and consistency, before adding water.

E. Protect mixtures from frost, contamination, and evaporation.

F. Do not retemper mixes after initial set has occurred.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify that surfaces and site conditions are ready to receive Work. Notify Architect in writing of all unsatisfactory surfaces and conditions.

B. Masonry: Verify joints are cut flush and surface is ready to receive Work of this Section. Verify no bituminous or water repellent coatings exist on masonry surface.

C. Grounds and Blocking: Verify items within walls for other Sections of Work have been installed.

D. Mechanical and Electrical: Verify services within walls have been tested and approved.

E. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Protect surfaces near the Work of this Section from damage, disfiguration, and overspray. Mask off all ventilation screeds occurring in plastered areas.

B. Clean concrete and masonry surfaces of foreign matter. Clean surfaces using acid solutions, solvents, or detergents. Wash surfaces with clean water.

C. Roughen smooth concrete surfaces.

D. Apply bonding agent in accordance with manufacturer's instructions.

3.3 INSTALLATION - LATHING MATERIALS

A. Install metal lathing in accordance with ML/SFA 920, ASTM C1063 and as specified herein.

B. On vertical surfaces apply 2 layers of underlayment over substrate; weatherlap horizontal edges 6 inches, vertical edges 6 inches. Fasten in place at 12 inches on center vertically over stud. Tape seal all joints and penetrations on base layer. Installation to conform to Single “Separate” Layer Method in accordance with TSIB Bulletin 60.220.

C. Install penetration flashing around all openings and penetrations in exterior walls in compliance with underlayment manufacturer's recommendations and in conformance with recommendations contained in Plaster and Lathing Systems Manual and ML/SFA 920. Turn sill flashing up 6 inches at jambs. Extend flashing back onto sill, jamb, and head of all openings.

D. Apply metal lath taut, with long dimension perpendicular to supports.

E. Lap ends of expanded metal lath a minimum of 1 inch. Secure end laps with tie wire where they occur between supports.

F. Lap sides of expanded metal lath a minimum of 1-1/2 inches.

G. Lap sides of welded wire lath a minimum of 1 mesh opening spacing at sides and ends. End laps shall occur over supports.

H. Furr out metal lath from vertical supports or backing not less than 1/4 inch. Furring of metal lath on vertical supports having a bearing surface width of 1-5/8 inches or less is not required.

I. Attach metal lath to wood supports using 1-1/2 inch No. 11 galvanized nails with 7/16 inch diameter heads at maximum 6 inches on center. In addition, at horizontal wood supports, secure lath to each support with 1/2 inch wide, 1-1/2 inch long No. 9 W & M gage ring shank, hook staple placed around a 10d common nail laid flat under the surface of the lath at 27 inches o.c. and not more than 3 inches from the edge of each sheet.

J. Attach metal lath to concrete and masonry using powder actuated fastener with washers with minimum 1 inch penetration into substrate. Space at maximum 16 inches on center horizontally and 6 inches on center vertically. Securely wire tie side laps.

K. Continuously reinforce internal angles with corner mesh, except where corner joint No. 30 is shown. Fasten at perimeter edges only.

L. Place beaded external angle with mesh at corners. Fasten at outer edges only.

M. Place strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

N. Place 6 inch wide strips of metal lath centered over junctions of dissimilar backing materials. Secure rigidly in place.

O. Place window/door drip screed at head of all windows and door openings in exterior walls.

P. Place weep screed at base of all vertical plaster applications at foundation line not less than 4 inches above earth or 2 inches above paved surfaces. Underlayment and lath shall cover and terminate on the attachment flange of the screed.

Q. Place drip screed at base of all vertical plaster applications which do not terminate at framed wall openings or at foundation line.

R. Place vent screed in soffit areas indicated.

S. Place casing beads at all terminations of plaster finish not otherwise indicated to have screeds installed and at all intersections with dissimilar materials. Butt and align ends. Secure rigidly in place.

T. Install accessories to lines and levels.

3.4 CONTROL AND EXPANSION JOINTS

A. Locate exterior control and expansion joints as indicated on drawings but not to exceed 12'-0" o.c. horizontally or vertically.

B. Establish control and expansion joints with specified joint device.

C. Attach control and expansion joints to metal lath with wire ties.

D. Install expansion joint over 3 inch wide strip of polypropylene tape to assist with air seal continuity.

E. Cut metal lath behind expansion joints.

F. Coordinate joint placement with other related Work.

3.5 PLASTERING

A. Apply plaster in accordance with ASTM C926 and PCA Portland Cement Plaster (Stucco) Manual.

B. Three Coat Application: At metal lathed surfaces, apply scratch coat to a nominal thickness of 3/8 inch, brown coat to a nominal thickness of 3/8 inch, and finish coat to a nominal thickness of 1/8 inch.

C. Two Coat Application: At concrete and masonry surfaces, apply 1/2 inch thick leveling coat and then 1/8 inch finish coat.

D. Moisture Curing: Moist cure plaster surfaces using a fine fog spray to assure continuous hydration of cementitious materials. Where hot, dry and windy conditions exist, plaster surfaces shall be moistened and covered with a single sheet of polyethylene plastic to prevent water loss thru evaporation.

E. Moist cure scratch and brown coats. Do not apply brown coat sooner than 48 hours following scratch coat.

F. After curing, dampen base coat prior to applying finish coat. Do not apply finish coat sooner than 7 days following brown coat.

G. Apply acrylic-based finish coat as factory packaged; do not add other ingredients; comply with manufacturer's written instructions.

3.6 FINISH COAT TEXTURE

A. Fine Sand Float as defined by photographs and application procedures in the Plaster Texture Brochure published by the Technical Services and Information Bureau, www.tsib.org.

3.7 TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 10 feet.

3.8 CLEANING

A. Remove protective maskings.

B. Remove any overspray from surrounding materials.

C. Clean adjacent affected surfaces.

3.9 PLASTER APPLICATION SCHEDULE

A. Exterior Vertical Surface of Framed Walls: Three coat plaster over metal lath and underlayment.

B. Exterior Horizontal Framed Surfaces: Three coat plaster over metal lath.

C. Exterior Horizontal and Vertical Concrete and Masonry Surfaces: Two coat plaster over metal lath and bonding agent.

END OF SECTION

SECTION 09 30 12

CERAMIC TILE WALL FINISHING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ceramic tile wall and wainscot finish using the thinset application method.

B. Ceramic tile base.

1.2 REFERENCES

A. ANSI/TCNA A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.

B. ANSI/TCNA A118.4 - American National Standard Specification for Modified Dry-Set Cement Mortar.

C. ANSI/TCNA A118.7 - American National Standard Specification for High Performance Cement Grouts for Tile Installation.

D. ANSI/TCNA A137.1 - Specifications for Ceramic Tile.

E. ASTM D226 - Asphalt-Saturated Felt Used in Roofing and Waterproofing.

F. TCNA (Tile Council of North America) - Handbook for Ceramic, Glass, and Stone Tile Installation.

1.3 SUBMITTALS

A. Submit samples under provisions of Section 01 33 00.

B. Mount tile and apply grout on two 24 x 24 inch plywood panels, representative of pattern, color variations, and grout joint size variations.

C. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

D. Submit maintenance data under provisions of Section 01 77 00.

E. Include recommended cleaning and stain removal methods, and cleaning materials.

1.4 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit manufacturer's data for post consumer and pre-consumer recycled material under the provisions of Section 01 81 13.

1.5 QUALITY ASSURANCE

A. Conform to ANSI/TCNA A137.1 for tile material.

B. Conform to ANSI/TCNA Standards and TCNA Handbook for tile installation.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of products specified in this Section with minimum five years documented experience.

B. Installer: Company specializing in applying the Work of this Section with minimum five years documented experience.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain 50 degrees F during installation of mortar materials.

1.8 EXTRA MATERIALS

A. Provide extra quantity of full size tile and trim shape units to Owner under provisions of Section 01 77 00.

B. Provide quantity equal to 5 percent of units installed of each shape and color.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS - TILE

A. American Olean Tile Co., Inc., www.aotile.com.

B. Crossville Ceramics, www.crossvilleinc.com.

C. Dal-Tile Corp., www.daltile.com.

D. Florida Tile Industries, Inc., www.floridatile.com.

E. Interceramic, www.interceramic.com.

F. Shaw Commercial, www.shawinc.com.

G. Summitville Tiles, Inc., www.summitville.com.

H. United States Ceramic Tile Co., www.usctco.com.

I. Substitutions: Under provisions of Section 01 25 13.

2.2 TILE MATERIAL

A. Ceramic Wall Tile: ANSI/TCNA A137.1, conforming to the following:

Manufacturer and Product:	Equivalent to the Color Wheel Collection - Classic by Daltile Corporation.
Size:	4-1/4 x 4-1/4 x 5/16 inch
Color:	As selected by Architect from Price Groups 1 through 4. Up to four different colors will be selected for use in varying amounts at all ceramic wall tile locations.

B. Base: Match field wall tile for moisture absorption, surface finish, and color; straight bottom.

C. Wainscot Cap: Match field wall tile for moisture absorption, surface finish, and color, bullnosed top edge.

2.3 MANUFACTURERS - MORTAR AND GROUT

A. American Olean Tile Co., Inc., www.aotile.com.

B. Custom Building Products, www.custombuildingproducts.com.

C. Dal-Tile Corp., www.daltile.com

D. H.B. Fuller Company, www.hbfuller.com.

E. Laticrete International, Inc., www.laticrete.com.

F. MAPEI, www.mapei.com.

G. W.R. Bonsal Company, www.bonsal.com.

H. Substitutions: Under provisions of Section 01 25 13.

2.4 MORTAR MATERIALS

A. Latex-Portland Cement Mortar: ANSI/TCNA A118.4 and the following:

1. Acrylic resin latex additive.

2. Dry mortar mix supplied by latex manufacturer.

2.5 GROUT MATERIALS

A. Latex-Portland Cement Grout: ANSI/TCNA A118.7 of color selected and the following:

1. Acrylic resin latex additive.

2. Microban antimicrobial additive, www.microban.com.

3. Dry mortar mix supplied by latex manufacturer.

2.6 ACCESSORIES

A. Membrane: ASTM D226; No. 15 asphalt saturated roofing felt.

B. Sealant: Type specified in Section 07 92 00.

2.7 MORTAR MIX AND GROUT MIX

A. Mix and proportion pre-mix setting bed and grout materials in accordance with manufacturer's instructions and referenced standards.

2.8 SEALER

A. Tile and Grout Sealer: Aqua Mix Penetrating Sealer manufactured by Aqua Mix, Inc., www.aquamix.com.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means installer accepts condition of existing surfaces.

3.2 PREPARATION

A. Protect surrounding work from damage or disfiguration.

B. Vacuum clean existing surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.3 INSTALLATION - THINSET METHOD

A. Install mortar, tile, and grout in accordance with ANSI/TCNA 108.5 and applicable tile installation standards of the TCNA Handbook.

B. Install membrane over substrate; weatherlap horizontal edges 4 inches, vertical edges 6 inches.

C. Lay tile to pattern indicated. If not indicated, request from Architect. Do not interrupt tile pattern around openings.

D. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align wall, base, and floor joints.

E. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar or excess grout.

F. Form internal angles coved and external angles bullnosed.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep control joints free of mortar or grout. Apply sealant to joints.

I. Allow tile to set for a minimum of 48 hours prior to grouting.

J. Grout tile joints.

K. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 CLEANING

A. Clean work under provisions of 01 77 00.

B. Clean tile surfaces.

3.5 SEALING

A. Install sealer on all surfaces in accordance with manufacturer's instructions.

END OF SECTION

SECTION 09 30 14

PORCELAIN TILE FLOOR FINISHING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Porcelain tile floor finish using the thinset and full bed application method.

B. Porcelain tile base.

C. Threshold at door opening.

1.2 REFERENCES

A. ANSI/TCNA A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.

B. ANSI/TCNA A118.1 - American National Standard Specification for Dry-Set Cement Mortar.

C. ANSI/TCNA A118.4 - American National Standard Specification for Modified Dry-Set Cement Mortar.

D. ANSI/TCNA A118.7 - American National Standard Specification for High Performance Cement Grouts for Tile Installation.

E. ANSI/TCNA A118.12 - American National Standard Specification for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.

F. ANSI/TCNA A137.1 - Specifications for Ceramic Tile.

G. ASTM A1064 - Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

H. ASTM D4551 - Poly (Vinyl Chloride) (PVC) Plastic Flexible Concealed Water-Containment Membrane.

I. MIA - Marble Institute of America.

J. TCNA (Tile Council of North America) - Handbook for Ceramic, Glass, and Stone Tile Installation.

1.3 SUBMITTALS

A. Submit samples under provisions of Section 01 33 00.

B. Submit 4 samples of each tile, to indicate pattern and color variations.

C. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

D. Submit manufacturer's certificate under provisions of Section 01 33 00 that products meet or exceed ANSI/TCNA A137.1.

E. Submit maintenance data under provisions of Section 01 77 00.

F. Include recommended cleaning and stain removal methods, and cleaning materials.

1.4 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Credit MR 4, submit data for post consumer and pre-consumer recycled content under the provisions of Section 01 81 13.

1.5 REGULATORY REQUIREMENTS

A. Ceramic Tile Flooring shall be stable, firm, and slip resistant. CBC Section 11B-302.1.

1.6 QUALITY ASSURANCE

A. Conform to ANSI/TCNA A137.1 for tile material.

B. Conform to ANSI/TCNA A137.1 DCOF AcuTest for coefficient of friction.

C. Conform to ANSI/TCNA Standards and TCNA Handbook for tile installation.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of products specified in this Section with minimum five years documented experience.

B. Installer: Company specializing in applying the work of this Section with minimum five years documented experience.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Maintain 50 degrees F during installation of mortar materials.

1.9 EXTRA MATERIALS

A. Provide extra quantity of full size tile and trim shape units to Owner under provisions of Section 01 77 00.

B. Provide quantity equal to 10 percent of units installed of each shape and color.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS - TILE

A. Crossville Ceramics, www.crossvilleinc.com.

B. Dal-Tile Corp., www.daltile.com.

C. Emser Tile, www.emser.com.

D. Fiandre, www.fiandre.com.

E. Imola Ceramica, www.imolaceramica.com.

F. Interceramic, www.interceramic.com.

G. Iris Ceramics, www.irisfmg.com.

H. Portobello America, Inc., www.portobelloamerica.com.

I. Pantheon Tile, www.pantheontile.com.

J. Shaw Commercial, www.shawinc.com.

K. Substitutions: Under provisions of Section 01 25 13.

2.2 TILE MATERIAL

A. 12 x 12 inch Porcelain Tiles: Haut Monde, Fabrique, Continental Slate, or Portfolio Series by Dal-Tile Corporation.

B. 2 x 2 inch Porcelain Mosaic Tiles (Shower): Haut Monde, Fabrique, or Portfolio Series by Dal-Tile Corporation.

C. Color: As selected by Architect from manufacturer's complete range.

2.3 MANUFACTURERS - MORTAR AND GROUT

A. Custom Building Products, www.custombuildingproducts.com.

B. H.B. Fuller Company, www.hbfuller.com.

C. Hydromet, www.bostikfindley-usa.com.

D. Laticrete International, Inc., www.laticrete.com.

E. MAPEI, www.mapei.com.

F. Substitutions: Under provisions of Section 01 25 13.

2.4 MORTAR MATERIALS

A. Portland Cement Mortar Materials: ANSI/TCNA A118.1.

B. Latex-Portland Cement Mortar: ANSI/TCNA A118.4 and the following:

1. Acrylic resin latex additive.

2. Dry mortar mix supplied by latex manufacturer.

2.5 GROUT MATERIALS

A. Portland Cement Grout Materials : ANSI/TCNA A118.7.

B. Latex-Portland Cement Grout: ANSI/TCNA A118.7 of color selected and the following:

1. Acrylic resin latex additive.

2. Microban antimicrobial addative, www.microban.com.

3. Dry mortar mix supplied by latex manufacturer.

2.6 ACCESSORIES

A. Thin Load Bearing Direct Bond Membrane: Chlorinated polyethylene elastomer sheet material laminated with fabric on both sides meeting requirements of ANSI A118.12.

1. Dal-Tile Corp., Dal Seal TS, www.daltile.com.

2. Compotite Corp., Composeal Gold, www.compotite.com.

3. Mapei, Mapelastic Aqua Defense, www.mapei.com.

4. Noble Company, Noble Seal TS, www.noblecompany.com.

5. Substitutions: Under provisions of Section 01 25 13.

B. Waterproof Membrane: ASTM D4551, Grade 40, polyvinyl chloride sheet.

1. Compotite Corporation, www.compotite.com.

2. Dal-Tile Corp., www.daltile.com.

3. Noble Company, www.noblecompany.com.

4. Substitutions: Under provisions of Section 01 25 13.

C. Reinforcing Mesh: ASTM A1064, 2 x 2 inch size, of WO.5/WO.5 wire size; welded fabric, galvanized.

D. Thresholds: Marble complying with Group A of the Marble Institute of America (MIA), color selected by Architect; profile as indicated or selected from manufacturer's standard shapes.

E. Sealant: Type specified in Section 07 92 00.

2.7 MORTAR MIX AND GROUT MIX

A. Mix and proportion pre-mix setting bed bond coat and grout materials in accordance with manufacturer's instructions, and referenced standards.

2.8 SEALER

A. Tile and Grout Sealer: Aqua Mix Penetrating Sealer manufactured by Aqua Mix, Inc., www.aquamix.com.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means installer accepts condition of existing surfaces.

3.2 PREPARATION

A. Protect surrounding work from damage or disfiguration.

B. Vacuum clean existing surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Blend tiles before installation to produce an even range of color and finish.

3.3 INSTALLATION - THINSET METHOD

A. Install mortar, bond coat, tile, and grout in accordance with ANSI/TCNA 108.5 and applicable tile installation standards of the TCNA Handbook.

B. Set marble thresholds at interior door openings.

C. Install thin load bearing direct bond membrane.

D. Apply bond coat.

E. Lay tile to pattern indicated on Drawings or if not indicated, request pattern from Architect. Do not interrupt tile pattern through openings.

F. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align floor, base, and wall joints.

G. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

H. Sound tile after setting. Replace hollow sounding units.

I. Allow tile to set for a minimum of 48 hours prior to grouting.

J. Grout tile joints.

K. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 INSTALLATION - FULL MORTAR BED METHOD

A. Install mortar bed, tile, and grout in accordance with ANSI/TCNA 108.5 and applicable tile installation standards of the TCNA Handbook.

B. Install waterproof membrane material. Extend vertically up wall a minimum of 6 inches. Extend into floor drain. Use recommended solvent cement to weld joints when pan dimensions exceed maximum width of material.

C. Set marble thresholds at interior door openings.

D. Apply mortar bed over surfaces to a thickness of 1-1/2 inch and to slopes as shown.

E. Install reinforcing mesh in middle of mortar bed.

F. Install thin load bearing direct bond membrane in bond coat. Extend vertically up wall a minimum of 6 inches. Extend into floor drains. Use recommended solvent cement to weld joints when membrane dimensions exceed maximum width of material.

G. Apply bond coat.

H. Lay tile to pattern indicated on Drawings, or if not indicated, request from Architect. Do not interrupt tile pattern through openings.

I. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align floor, base, and wall joints.

J. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight without voids, cracks, excess mortar, or excess grout.

K. Sound tile after setting. Replace hollow sounding units.

L. Allow tile to set for a minimum of 48 hours prior to grouting.

M. Grout tile joints.

N. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.5 CLEANING

A. Clean work under provisions of Section 01 77 00.

B. Clean tile surfaces.

3.6 SEALING

A. Install sealer on all surfaces in accordance with manufacturer's recommendations.

3.7 PROTECTION

A. Protect finished installation under provisions of Section 01 61 00.

B. Do not permit traffic over finished floor surface for a minimum of 48 hours. After 48 hours and until 72 hours, cover area with 3/8 inch plywood panels if traffic is required.

END OF SECTION

SECTION 09 30 15

PORCELAIN TILE WALL FINISHING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Porcelain tile wall and wainscot finish using the thinset and full bed application method.

B. Porcelain tile base.

1.2 REFERENCES

A. ANSI/TCNA A108.5 - Installation of Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.

B. ANSI/TCNA A118.1 - American National Standard Specification for Dry-Set Cement Mortar.

C. ANSI/TCNA A118.4 - American National Standard Specification for Modified Dry-Set Cement Mortar.

D. ANSI/TCNA A118.7 - American National Standard Specification for High Performance Cement Grouts for Tile Installation.

E. ANSI/TCNA A118.15 - Modified Improved Dry-Set Cement Mortar.

F. ANSI/TCNA A137.1 - Specifications for Ceramic Tile.

G. ASTM C847 - Standard Specifications for Metal Lath.

H. ASTM D226 - Asphalt-Saturated Felt Used in Roofing and Waterproofing.

I. TCNA (Tile Council of North America) - Handbook for Ceramic, Glass, and Stone Tile Installation.

1.3 SUBMITTALS

A. Submit samples under provisions of Section 01 33 00.

B. Submit 4 samples of each tile, representative of pattern and color variations.

C. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

D. Submit maintenance data under provisions of Section 01 77 00.

E. Include recommended cleaning and stain removal methods, and cleaning materials.

1.4 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit manufacturer's data for post consumer and pre-consumer recycled material under the provisions of Section 01 81 13.

1.5 QUALITY ASSURANCE

A. Conform to ANSI/TCNA A137.1 for tile material.

B. Conform to ANSI/TCNA Standards and TCNA Handbook for tile installation.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of products specified in this Section with minimum five years documented experience.

B. Installer: Company specializing in applying the work of this Section with minimum five years documented experience.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain 50 degrees F during installation of mortar materials.

1.8 EXTRA MATERIALS

A. Provide extra quantity of full size tile and trim shape units to Owner under provisions of Section 01 77 00.

B. Provide quantity equal to 10 percent of units installed of each shape and color.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS - TILE

A. Crossville Ceramics, www.crossvilleinc.com.

B. Dal-Tile Corp., www.daltile.com.

C. Emser Tile, www.emser.com.

D. Imola Ceramica, www.imolaceramica.com.

E. Interceramic, www.interceramic.com.

F. Iris Ceramics, www.irisfmg.com.

G. Portobello America, Inc., www.portobelloamerica.com.

H. Pantheon Tile, www.pantheontile.com.

I. Shaw Commercial, www.shawinc.com.

J. Substitutions: Under provisions of Section 01 25 13.

2.2 TILE MATERIAL

A. 12 x 24 inch Porcelain Tiles: Haut Monde, Santino, Fabrique, Continental Slate, or Portfolio Series by Dal-Tile Corporation.

B. 12 x 24 inch Porcelain Tiles: Haut Monde, Santino, Fabrique, Continental Slate, or Portfolio Series by Dal-Tile Corporation.

C. 2 x 2 inch Porcelain Mosaic Tiles (ceiling and shower niche): Haut Monde, Fabrique, or Portfolio Series by Dal-Tile Corporation.

D. Color: As selected by Architect from manufacturer's complete range.

2.3 MANUFACTURERS - MORTAR AND GROUT

A. Custom Building Products, www.custombuildingproducts.com.

B. H.B. Fuller Company, www.hbfuller.com.

C. Hydromet, www.bostikfindley.com.

D. Laticrete International, Inc., www.laticrete.com.

E. MAPEI, www.mapei.com.

F. Substitutions: Under provisions of Section 01 25 13.

2.4 MORTAR MATERIALS

A. Portland Cement Mortar Materials: ANSI/TCNA A118.1.

B. Modified Improved Dry-Set Cement Mortar: ANSI/TCNA A118.15, Ultraflex LFT as manufactured by MAPEI.

2.5 GROUT MATERIALS

A. Portland Cement Grout Materials: ANSI/TCNA A118.7.

B. Latex-Portland Cement Grout: ANSI/TCNA A118.7 of color selected and the following:

1. Acrylic resin latex additive.

2. Microban antimicrobial additive, www.microban.com.

3. Dry mortar mix supplied by latex manufacturer.

2.6 ACCESSORIES

A. Membrane: ASTM D226; No. 15 asphalt saturated roofing felt.

B. Waterproof Membrane: Noble Seal TS manufactured by Noble Company.

C. Reinforcing Mesh: ASTM C847; 3.4 lb./sq.yd. expanded metal, galvanized, self-furring type.

D. Backing Board: ANSI/TCNA A118.9; High density, cementitious, glass fiber reinforced, 1/2 inch thick; 2 inch wide coated glass fiber tape for joints and corners; manufacture licensed by TCNA.

E. Finishing Metal Trim: Schluter Quadec, Satin Nickel Anodized Aluminum.

F. Sealant: Type specified in Section 07 92 00.

2.7 MORTAR MIX AND GROUT MIX

A. Mix and proportion pre-mix setting bed and grout materials in accordance with manufacturer's instructions and referenced standards.

2.8 SEALER

A. Tile and Grout Sealer: Aqua Mix Penetrating Sealer manufactured by Aqua Mix, Inc., www.aquamix.com.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means installer accepts condition of existing surfaces.

3.2 PREPARATION

A. Protect surrounding work from damage or disfiguration.

B. Vacuum clean existing surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Blend tiles before installation to produce an even range of color and finish.

3.3 INSTALLATION - THINSET METHOD

A. Install mortar, tile, and grout in accordance with ANSI/TCNA 108.5 and applicable tile installation standards of the TCNA Handbook.

B. Lay tile to pattern indicated. If not indicated, request from Architect. Do not interrupt tile pattern around openings.

C. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align wall, base, and floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar or excess grout.

E. Form internal angles square and external angles bullnosed.

F. Sound tile after setting. Replace hollow sounding units.

G. Allow tile to set for a minimum of 48 hours prior to grouting.

H. Grout tile joints.

I. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 INSTALLATION - FULL MORTAR BED METHOD

A. Install mortar bed, tile, and grout in accordance with applicable ANSI/TCNA 108.5 and applicable tile installation standards of the TCNA Handbook.

B. Install membrane and reinforcing mesh.

C. Apply mortar bed over surfaces to a thickness of 3/4 inch.

D. Lay tile to pattern indicated. If not indicated request from Architect. Do not interrupt tile pattern around openings.

E. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align wall, base, and floor joints.

F. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight without voids, cracks, excess mortar or excess grout.

G. Form internal angles square and external angles square.

H. Sound tile after setting. Replace hollow sounding units.

I. Keep control joints free of mortar or grout. Apply sealant to joints.

J. Allow tile to set for a minimum of 48 hours prior to grouting.

K. Grout tile joints.

L. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.5 CLEANING

A. Clean work under provisions of Section 01 77 00.

B. Clean tile surfaces.

3.6 SEALING

A. Install sealer on all surfaces in accordance with manufacturer's instructions.

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical panels.

C. Non-fire rated assembly.

D. Perimeter trim.

1.2 REFERENCES

A. ASTM A513 - Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.

B. ASTM A641 - Zinc-Coated (Galvanized) Carbon Steel Wire.

C. ASTM C635 - Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

D. ASTM C636 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

E. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

F. ASTM E84 - Test Methods for Surface Burning Characteristics of Building Materials.

G. ASTM E580 - Application of Ceiling Suspension Systems for Acoustic Tile and Lay-in Panels in Areas Requiring Seismic Restraint.

H. ASTM E1264 - Classification of Acoustical Ceiling Products.

I. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

J. ICC - ES - International Code Council Evaluation Service, Inc.

K. UL - Underwriters' Laboratories Building Material Directory.

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacture of ceiling suspension system and ceiling panels with five years minimum experience.

B. Installer: Company with five years minimum documented experience, approved by manufacturer.

1.4 REGULATORY REQUIREMENTS

A. Conform to CBC, California Building Code (CCR) California Code of Regulations, Title 24, Part 2, Chapter 16 for suspension system requirements. [and DSA IR 25-2.13].

B. Conform to applicable UL and CBC combustibility requirements for materials.

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00.

B. On shop drawings, indicate grid layout and related dimensioning, junctions with other work or ceiling finishes, and interrelation of mechanical and electrical items related to system.

C. Provide product data on metal grid system components and acoustic units.

D. Submit samples under provisions of Section 01 33 00.

E. Submit two samples 6 x 6 inch in size, illustrating material and finish of acoustic units.

F. Submit two samples each, 12 inches long, of suspension system main runner, cross runner, and edge trim.

1.6 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit manufacturer's data for content of post-consumer and pre-consumer recycled content under provisions of Section 01 81 13.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain uniform temperature of minimum 60 degrees F, and humidity of 50 percent prior to, during, and after installation.

1.8 SEQUENCING/SCHEDULING

A. Do not install acoustical ceilings until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Schedule installation of acoustic units after interior wet work is dry.

1.9 EXTRA STOCK

A. Provide extra quantity of acoustic units to Owner under provisions of Section 01 77 00.

B. Provide quantity equal to 10 percent of units installed.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - SUSPENSION SYSTEM

A. Armstrong Ceiling Systems, www.armstrongceilings.com. ICC-ES No. ESR-1308.

B. Certainteed, www.certainteed.com ICC-ES No. ESR-3336.

C. Chicago Metallic Corporation, www.chicagometallic.com. ICC-ES No. ESR-2631.

D. USG Interior Systems, (DONN), www.usg.com. ICC-ES No. ESR-1222.

E. Substitutions: Under provisions of Section 01 25 13.

2.2 SUSPENSION SYSTEM MATERIALS

A. Grid: ASTM C635, heavy duty, non-fire rated, exposed T; components die cut and interlocking. Catalog numbers of acceptable manufacturer are indicated on drawings. Perimeter grid to be shadow mold type with seismic perimeter clip.

B. Accessories: Stabilizer bars, clips, splices, and edge moldings required for suspended grid system.

C. Grid Materials: Commercial quality cold rolled steel with galvanized coating.

D. Grid Finish: Off-White color, baked enamel.

E. Support Channels and Hangers: Galvanized steel; size and type to suit application, to rigidly secure acoustic ceiling system including integral mechanical and electrical components, as detailed on drawings.

F. Compression Strut: ASTM A513, telescoping tube design, galvanized 3/4 inch diameter 14 gage rigid steel tubing with crimped end attached to roof framing and secured to 1/2 inch diameter 14 gage rigid steel tubing with crimped end to main runners. Equivalent pre-manufactured compression post supplied by ceiling grid manufacturer.

G. Hanger Wire: ASTM A641, Class 1 coating (galvanized), soft temper, No. 12 gage.

2.3 ACCEPTABLE MANUFACTURERS - ACOUSTIC UNITS

A. Armstrong Ceiling Systems, www.armstrongceilings.com.

B. Certainteed, www.certainteed.com.

C. USG Interiors, Inc., www.usg.com.

D. Substitutions: Under provisions of Section 01 25 13.

2.4 ACOUSTIC UNIT MATERIALS

A. Acoustic Panels: ASTM E1264, conforming to the following:

1. Equivalent to Ultima-H1-RL manufactured by Armstrong Ceiling System.

Size	:	24 x 24 inches
Thickness	:	3/4 inches
NRC Range	:	0.7 minimum
Edge	:	Beveled Tegular
Surface Color		White
Flame Spread		ASTM E84 (0-25) Class A, UL 25 or under
Smoke Density		Not to exceed 450 when tested in accordance with CBC Standard No. 12-8-1
Mold/Mildew Inhibitor	:	Biocide treatment that inhibits mold and mildew when tested according to ASTM D3273.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify that existing conditions are ready to receive work.

B. Verify that layout of hangers will not interfere with other work.

C. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION - GRID SYSTEM

A. Install system in accordance with ASTM C636 and ASTM E580 as supplemented in this Section and with notes on the drawing entitled Metal Suspension Systems for Lay In Panel Ceilings.

B. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.

C. Hang system independent of columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

D. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

E. Compression struts to be installed at each main runner not exceeding 12'- 0" o.c. in both directions and not more than 8 inches from end of main runner. Insert main 3/4 inch tube over 1/2 inch tube with a minimum 6 inch lap. Secure crimped end of main 3/4 inch tube to structural framing with wood screws and 1/2 inch tube to main runner with metal screws. Secure tube sections together with 2 set screws. Install prefabricated compression post according to manufacturer's recommendations.

F. Locate system on room axis according to reflected plan.

G. Do not eccentrically load system, or produce rotation of runners.

H. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.

3.3 INSTALLATION - ACOUSTIC UNITS

A. Field rabbet cut edge of perimeter tiles to match factory rabbeted edge. Paint cut surface if necessary to match surface of tile.

B. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units one way in room. Fit border neatly against abutting surfaces.

D. Install acoustic units level, in uniform plane, and free from twist, warp and dents.

3.4 TOLERANCES

A. Maintain tolerances in accordance with Section 01 43 00.

B. Variation from flat and level surface: 1/8 inch in 10 feet.

C. Variation from plumb of grid members caused by eccentric loads: Two degrees maximum.

END OF SECTION

SECTION 09 65 00

RESILIENT FLOORING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient top set base.

1.2 REFERENCES

A. 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design.

B. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

C. CDH - California Department of Health Standard Practice Method V1.1-2010 for the Testing of Volatile Organic Emissions.

D. ASTM D2047 - Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.

E. ASTM E648 - Test Method for Critical Radiant Flux of Floor-Covering Systems using a Radiant Energy Source.

F. ASTM E662 - Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

G. ASTM F710 - Practice for Preparing Concrete Floors and other Monolithic Floors to Receive Resilient Flooring.

H. ASTM F1066 - Specification for Vinyl Composition Floor Tile.

I. ASTM F1303 - Specification for Sheet Vinyl Floor Covering

J. ASTM F1344 - Specification for Rubber Floor Tile.

K. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile.

L. ASTM F1861 - Standard Specification for Resilient Wall Base.

M. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

N. ASTM F2170 - Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probe.

O. FS RR-T-650 - Treads, Metallic and Non-metallic, Non-skid.

P. FS SS-T-312b - Tile, Floor: Asphalt, Rubber, Vinyl, Vinyl Composition.

1.3 REGULATORY REQUIREMENTS

A. Resilient flooring to comply with the following fire performance characteristics as determined by testing products per ASTM test method indicated below:

1. Critical Radiant Flux: 0.45 watts per sq cm or more per ASTM E648.

2. Smoke Density: Less than 450 per ASTM E662.

B. Maximum volatile organic compound (VOC) emissions shall meet the CDPH test results obtained at the 14 day time period when tested by Method V1.1-2010.

C. Resilient flooring products shall have a coefficient of friction when tested according to ASTM D2047 of 0.60 for flat floors and 0.80 for ramped surfaces.

D. Conform to CBC, California Building Code, (CCR) Title 24, Part 2, and the 2010 ADA Standards for Accessible Design for accessibility requirements.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00.

B. Provide seaming and pattern plan.

C. Submit samples under provisions of Section 01 33 00.

D. Submit two samples 3 x 3 inches in size, illustrating color and pattern for each floor material specified.

E. Submit two 2 inch long samples of base material for each material specified.

F. Submit manufacturer’s written installation instructions.

G. Submit Owner's written acceptance of final floor finish of vinyl composition tile to Architect under provisions of Section 01 77 00.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit manufacturer’s product data for adhesives including printed statement of VOC content under the provisions of Section 01 81 13.

B. LEED Submittal: Laboratory test results for adhesives indicating requirements for low emitting materials according to Section 01 81 13.

C. LEED Submittal: Submit Environmental Product Declaration for each product under provisions of Section 01 81 13.

D. LEED Submittal: Submit Health Product Declaration for each product under provisions of Section 01 81 13.

E. LEED Submittal: Sourcing of Raw Materials; Submit Corporate Sustainability Report for each manufacturer under provisions of Section 01 81 13.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit cleaning and maintenance data under provisions of Section 01 77 00.

B. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Concrete subfloor to be allowed to cure for a minimum of 90 days to achieve acceptable dryness.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

C. Maintain ambient temperature required by adhesive manufacturer three days prior to, during, and 24 hours after installation of materials.

D. Moisture Testing: Perform tests as recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

1. Subfloor Moisture Conditions: Moisture emission rate of no more than 3 lb/1000 sq. ft./24 hours when tested by the Quantitive Anhydrous Calcium Chloride Test, ASTM F1869, with subfloor temperature not less than 65 degrees F.

2. Subfloor Humidity Conditions: Relative humidity level of no more than 75 percent when tested by in situ drilled probes according to ASTM F2170.

3. Subfloor Alkalinity Conditions: pH range of between 5 to 9 when subfloor is wetted with potable water and pHdrion paper is applied.

1.8 EXTRA MATERIALS

A. Provide 100 sq ft of flooring and 100 lineal feet of base of each material specified under provisions of Section 01 77 00.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - BASE MATERIALS

A. Johnsonite, www.johnsonite.com.

B. Substitutions: Under provisions of Section 01 25 13.

2.2 BASE MATERIALS

A. Base: Millwork Reveal by Johnsonite, 4-1/4 inch high, 1/4 inch thick. Color as selected by Architect from manufacturer’s complete range.

2.3 ACCESSORIES

A. Subfloor Filler: White premix Portland Cement latex type as recommended by flooring material manufacturer.

B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer for high moisture application. Shall meet South Coast Air Quality Management District (SCAQMD) Rule #1168.

C. Edge Strips: Rubber.

D. Sealer and Wax: Types recommended by flooring manufacturer. Coordinate selection of floor wax with Owner's maintenance program.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that concrete slabs comply with ASTM F710 and are as specified herein.

B. Verify concrete floors exhibit acceptable moisture emission rate and humidity level; and exhibit negative alkalinity, carbonization, or dusting.

C. Verify that surfaces are smooth and flat and are ready to receive Work.

D. Beginning of installation means acceptance of existing substrate and site conditions.

3.2 PREPARATION

A. Prepare concrete substrate according to ASTM F710 and flooring manufacturer's recommendations..

B. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

C. Apply, trowel, and float filler to leave a smooth, flat, hard surface.

D. Prohibit traffic from area until filler is cured.

E. Vacuum clean substrate.

F. Apply primer to concrete slab surfaces if recommended by flooring manufacturer.

3.3 INSTALLATION - BASE MATERIAL

A. Fit joints tight and vertical.

B. Install material in maximum practical lengths.

C. Maintain minimum measurement of 18 inches between joints, and minimize the total number of joints to the greatest extent possible.

D. Miter internal corners.

E. Field wrap external corners with longest practical lengths. "V" cut back surface to 2/3 its thickness.

F. Install base on solid backing. Bond tight to wall and floor surfaces.

G. Scribe and fit to door frames and other interruptions.

3.4 CLEANING

A. Remove excess adhesive from floor, base and wall surfaces without damage.

B. Sweep or vacuum floor thoroughly.

C. Damp mop with a neutral detergent solution.

D. Carefully remove black marks with a scrubbing pad or brush.

3.5 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Protect floor finish until final completion with a non-asphaltic building paper.

C. Maintain protective covering until final completion.

3.6 COMPLETION

A. At final completion, remove floor protection and correct any damage.

END OF SECTION

SECTION 09 65 66

RESILIENT ATHLETIC FLOORING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Resilient vinyl sport flooring.

B. Edge strips.

1.2 REFERENCES

A. 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design.

B. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

C. ASTM D2047 - Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.

D. ASTM E648 - Test Method for Critical Radiant Flux of Floor-Covering Systems using a Radiant Energy Source.

E. ASTM E662 - Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

F. ASTM F710 - Practice for Preparing Concrete Floors and other Monolithic Floors to Receive Resilient Flooring.

G. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

H. ASTM F2170 - Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probe.

I. ASTM F2772 - Standard Specification for Athletic Performance Properties of Indoor Sports Flooring Systems.

1.3 REGULATORY REQUIREMENTS

A. Resilient Flooring to comply with the following fire performance characteristics as determined by testing products per ASTM test method indicated below:

1. Critical Radiant Flux: 0.45 watts per sq cm or more per ASTM E648.

2. Smoke Density: Less than 450 per ASTM E662.

B. Products supplied for tile installation shall comply with local regulations controlling use of volatile organic compounds (VOC).

C. Resilient flooring products shall have a coefficient of friction when tested according to ASTM D2047 of 0.60 for flat floors and 0.80 for ramped surfaces.

D. Conform to CBC, California Building Code, (CCR) Title 24, Part 2, and the 2010 ADA Standards for Accessible Design for accessibility requirements.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Provide product data for flooring and adhesives.

C. Submit samples under provisions of Section 01 33 00.

D. Submit two samples 3 x 3 inches in size, illustrating color for floor material specified and for color of game lines indicated.

E. Submit shop drawings indicating floor joint pattern, grain direction, and termination details.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit manufacturer's product data for adhesives and sealants, including printed statement of VOC content under the provisions of Section 01 81 13.

B. LEED Submittal: Submit manufacturer's product data for paints and coatings, including printed statement of VOC content and chemical components under the provisions of Section 01 81 13.

C. LEED Submittal: Submit manufacturer's data for content of post-consumer and pre-consumer recycled content under provisions of Section 01 81 13.

1.6 QUALITY ASSURANCE

A. Provide independent certificate of testing that resilient flooring material complies with the requirements of ASTM F2772 for the floor classification specified. Sales literature is not acceptable.

1.7 QUALIFICATIONS

A. Installer: Company specializing in applying the work of this Section with minimum five years documented experience, approved by manufacturer.

1.8 OPERATION AND MAINTENANCE DATA

A. Submit cleaning and maintenance data under provisions of Section 01 77 00.

B. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products to site under provisions of Section 01 61 00.

B. Store and protect products under provisions of Section 01 61 00.

C. Store flooring products in upright position. Do not store in horizontal position.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Concrete subfloor to be allowed to cure for a minimum of 90 days to achieve acceptable dryness.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

C. Maintain ambient temperature required by adhesive manufacturer three days prior to, during, and 24 hours after installation of materials.

D. Moisture Testing: Perform tests as recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

1. Subfloor Moisture Conditions: Moisture emission rate of no more than 3 lb/1000 sq. ft./24 hours when tested by Quantitive Anhydrous Calcium Chloride Test, ASTM F1869, with subfloor temperature not less than 65 degrees F.

2. Subfloor Humidity Conditions: Relative humidity level of no more than 75 percent when tested by in situ drilled probes according to ASTM F2170.

3. Subfloor Alkalinity Conditions: A pH range of between 5 to 9 when subfloor is wetted with potable water and pHdrion paper is applied.

1.11 EXTRA MATERIALS

A. Provide extra materials under the provisions of Section 01 77 00.

B. Provide 20 lineal feet of flooring material.

1.12 WARRANTY

A. Provide installer’s standard two year warranty under provisions of Section 01 77 00.

B. Standard Warranty: Include coverage for faulty workmanship and installation under normal use and maintenance.

C. Provide manufacturer's warranty for 15 years under provisions of Section 01 77 00.

D. Manufacturer's Warranty: Material and manufacturing defects to include mold growth on or within installed flooring and floor failure due to substrate moisture exposure not exceeding 98 percent relative humidity when tested according to ASTM F2170 and 15 pounds moisture vapor emission rate when tested according to ASTM F1896.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Mondo Valor, 10 mm by Mondo, www.mondoworldwide.com. Install in sheet application. Coordinate with Architect on color selection(s), pattern(s), and layout(s). Colors as selected by Architect from manufacturer’s complete range.

B. Substitutions: Under provisions of Section 01 25 13.

2.2 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Adhesives: Moisture tolerant type recommended by flooring material manufacturer.

C. Edge Strips: Rubber. Color as selected.

D. Heat Welding Rod: Type recommended by flooring manufacturer, color to blend with floor color.

E. Edge Trim: Anodized aluminum at inside at inside corners, outside corners, top, and side.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that concrete slabs comply with ASTM F710 and are as specified herein.

B. Verify concrete floors exhibit acceptable moisture emission rate, humidity level and exhibit negative alkalinity, carbonization, or dusting.

C. Verify that surfaces are smooth and flat and are ready to receive Work.

D. Beginning of installation means acceptance of existing substrate and site conditions.

3.2 PREPARATION

A. Prepare concrete subfloor according to ASTM F710.

B. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

C. Apply, trowel, and float filler to leave a smooth, flat, hard surface.

D. Prohibit traffic from area until filler is cured.

E. Vacuum clean substrate.

F. Acclimate flooring materials by storing them in the space that will be installed for not less than 48 hours.

3.3 INSTALLATION

A. Install in accordance with manufacturer's installation instructions.

B. Apply adhesive to subfloor.

C. Roll flooring in place, press with heavy roller.

D. Heat weld all seams in accordance with manufacturer's installation instructions.

E. Install sheet flooring parallel to width of room. Provide minimum of 1/3 full roll width.

F. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.

G. Install edge strips at unprotected or exposed edges, and where flooring terminates.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.4 PROTECTION

A. Prohibit traffic on floor finish for 24 hours after installation.

3.5 CLEANING

A. Remove any excess adhesive residue from floor, base, and wall surfaces.

B. Clean floor surfaces.

END OF SECTION

SECTION 09 68 13

TILE CARPETING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Modular carpet tile installed by fully adhered method.

B. Accessories.

1.2 REFERENCES

A. ASTM D1335 - Tuft Bind of Pile Floor Coverings.

B. ASTM E648 - Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

C. ASTM E662 - Specific Optical Density of Smoke Generated by Solid Materials.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

E. ASTM F2170 - Determining Relative Humidity in Concrete Floor Slabs Using In-Situ Probe.

F. CRI 104 - Carpet and Rug Institute Standard for Installation of Commercial Textile Floorcovering Materials.

G. FTC - Federal Trade Commission Guides, Part 260, Guides for Use of Environmental Marketing Claims.

H. NFPA - National Fire Protection Association.

I. NSF / ANSI 140-2007e Sustainable Carpet Assessment.

1.3 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Provide product data on specified products, describing physical characteristics; sizes, patterns, colors available, and method of installation.

C. Submit samples under provisions of Section 01 33 00.

D. Submit two samples minimum 18 x 18 inch in size illustrating color and pattern for each carpet material specified.

1.4 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit manufacturer’s product data for adhesives including printed statement of VOC content under the provisions of Section 01 81 13.

B. LEED Submittal: Submit manufacturer's product data that carpet materials meet the requirements of the Carpet and Rug Institute Green Label Plus program.

C. LEED Submittal: Submit manufacturer’s data for content of post-consumer and pre-consumer recycled content under provisions of Section 01 81 13.

D. LEED Submittal: Submit Environmental Product Declaration for each product under provisions of Section 01 81 13.

E. LEED Submittal: Submit Health Product Declaration for each product under provisions of Section 01 81 13.

F. LEED Submittal: Sourcing of Raw Materials; Submit Corporate Sustainability Report for each manufacturer under provisions of Section 01 81 13.

1.5 RECYCLED CONTENT

A. Carpet must contain a minimum of 40 percent recycled content by weight.

B. Recycled content to be calculated by the following formula: (Recycled Content Weight) / (Total Product Weight) x 100 = Percent recycled content.

C. Carpet must contain a minimum of 10 percent post-consumer recycled content by weight from post-consumer carpet.

D. Recycled content to be certified by Scientific Certification Systems (SCS) or National Sanitation Foundation International. Product must carry label certifying overall recycled content.

E. Recycled content statements shall comply with FTC Part 260 Guidelines with respect to labeling, product inserts, and catalog representations.

1.6 RECYCLED PROGRAM

A. Manufacturer shall have an existing established collection and recovery system for carpet in operation.

B. Collection and recovery system shall be capable of reclaiming and recycling 100 percent of a vinyl backed carpet.

C. Current recycling program to be in accordance with FTC Guides, Section 260.7(d).

1.7 PRODUCT CERTIFICATION

A. Carpet must be certified with NSF 140-207(e) Sustainable Carpet Assessment Standards. Platinum level of certification.

1.8 OPERATION AND MAINTENANCE DATA

A. Submit maintenance data under provisions of Section 01 77 00.

B. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning and shampooing.

1.9 QUALITY ASSURANCE

A. Perform work in accordance with CRI 104.

B. Maintain one copy of document on site.

C. Carpet shall have an average tuft bind of 20 pounds when tested in accordance with ASTM D1335.

D. Carpet shall bear CRI Indoor Air Quality Carpet Testing Program Green Label Plus.

1.10 REGULATORY REQUIREMENTS

A. Floor covering to have an NFPA Class I rating with a minimum radiant flux of 0.45 watt per square centimeter when tested in accordance with ASTM E648.

B. Floor covering to have a smoke developed rating of less than 450 when tested in accordance with ASTM E662.

C. Carpet shall be securely attached and shall have firm cushion, pad, or backing or no cushion or pad. It shall have a level loop, textured loop, level cut pile, or level cut/uncut pile texture. Pile height shall be ½" maximum.

D. Exposed edges shall be fastened to floor surfaces and shall have trim on the entire length. Carpet edges shall comply with CBC Section 11B-303.

1.11 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and protect products to site under provisions of Section 01 61 00.

B. Comply with requirements of CRI 104 Section 4.0.

1.12 PROJECT/SITE CONDITIONS

A. Comply with requirements of CRI 104, Section 7.0.

B. Concrete subfloor to be allowed to cure for a minimum of 90 days to achieve acceptable dryness.

C. Store materials for three days prior to installation in area of installation to achieve temperature stability.

D. Moisture Testing: Perform tests as recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

1. Subfloor Moisture Conditions: Moisture emission rate of no more than 3 lb/1000 sq. ft./24 hours when tested by the Quantitive Anhydrous Calcium Chloride Test, ASTM F1869, with subfloor temperature not less than 65 degrees F.

2. Subfloor Humidity Conditions: Relative humidity level of no more than 75 percent when tested by in situ drilled probes according to ASTM F2170.

3. Subfloor Alkalinity Conditions: pH range of between 5 to 9 when subfloor is wetted with potable water and pHdrion paper is applied.

1.13 WARRANTY

A. Provide manufacturer's standard lifetime or 20 year non-prorated warranty under provisions of Section 01 77 00.

B. Performance Warranty: Manufacturer's warranty covering delamination of secondary backing, edge ravel and tuft bind of carpet under both wet and dry conditions.

C. Wear Warranty: Manufacturer's warranty that carpet will lose no more than 10 percent by weight of face yarn.

1.14 EXTRA MATERIALS

A. Provide full modular tiles equal to 5 percent of amount installed for each type and color but not less than 10 square yards under the provisions of Section 01 77 00.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Mannington Commercial, www.manningtoncommerical.com. Contact: Don Hampton, 909-921-5521, don.hampton@mannington.com.

1. Collection: Exchange 2, Style: Relay.

2. Collection: Quadrant, Style: Precision.

3. Color: As selected by the Architect from the manufacturer’s complete range.

B. Substitutions: Under provisions of Section 01 25 13.

2.2 MATERIALS

A. Carpet shall conform to published specification characteristics of named manufacturer as modified by requirements specified in this section.

B. Size: 12 x 36 inches up to 24 x 24 inches.

C. Fiber Type: Invista Antron Legacy, Antron Lumena or Universal Nylon Type 6, 6.

D. Pile Height: Maximum 1/2 inch.

E. Backing: Synthetic, non-woven, 100 percent recycled content. No latex backing to be used.

F. Soil-Resistance Treatment: Manufacturer's standard integral stain resistant treatment.

2.3 ACCESSORIES

A. Sub-Floor Filler: White premix portland cement and latex; type as recommended by carpet manufacturer.

B. Primers and Adhesives: Waterproof; releasable type recommended by carpet manufacturer. Shall meet South Coast Air Quality Management District (SCAQMD) Rule 1168.

C. Manufacturer's recommended pressure-sensitive adhesive system components]

D. Edge Strips: Vinyl type, color as selected. Strip shall be beveled with a slope no greater than 1 inch unit vertical to 2 units horizontal (50 percent slope).

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Examine subfloors and conditions for compliance with requirements for moisture content, humidity levels, alkalinity range and other conditions affecting performance of carpet.

B. Verify that subfloor surfaces are smooth and flat and are ready to receive work.

C. Beginning of installation means acceptance of subfloor and site conditions.

3.2 PREPARATION

A. Remove subfloor coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone.

B. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.

C. Apply, trowel, and float filler to leave smooth, flat, hard surface.

D. Prohibit traffic until filler is cured.

E. Apply subfloor primer compatible with adhesive where recommended by carpet manufacturer.

F. Vacuum floor surface.

3.3 INSTALLATION

A. Apply carpet and adhesive in accordance with manufacturer's instructions and CRI 104, Section 10.2.

B. Fully adhere carpet tile to substrate.

C. Lay carpet on floors with tiles laid in pattern as selected by the Architect.

D. Install pattern parallel to walls.

E. At doorways, center seams under door in closed position.

F. Fit seams straight, not crowded or peaked, free of gaps.

G. Extend carpet into toe spaces, door reveals, open-bottomed obstructions, alcoves and similar openings.

H. Cut and fit carpet around interruptions.

I. Fit carpet tight to intersection with vertical surfaces without gaps.

3.4 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Vacuum carpet surfaces.

3.5 PROTECTION

A. Comply with requirements of CRI 104, Section 13.7.

B. Prohibit traffic from carpet areas for 24 hours after installation.

END OF SECTION

SECTION 09 90 00

PAINTING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Products and application.

C. Surface finish schedule.

1.2 SUMMARY OF PAINTED SUBSTRATES

A. Section includes the application of paint systems on the following interior substrates:

1. Primed or unprimed steel.
2. Galvanized metal.
3. Steel handrails, guardrails and fittings.
4. Steel doors.
5. Access doors and frames.
6. Overhead coiling doors and frames.
7. Sectional overhead doors and frames.
8. Wood.
9. Horizontal and vertical gypsum board.
10. Suspended acoustic ceilings.
11. Applied acoustic ceilings.
12. Wall louvers.

B. Section includes the application of paint systems on the following exterior substrates:

1. Primed or unprimed steel.
2. Galvanized metal.
3. Steel handrails, guardrails, and fittings.
4. Decorative metal fencing.
5. Bollards.
6. Sheet metal flashing and trim.

7. Sheet metal gutters and downspouts.

8. Steel pipe downspouts.

9. Steel doors, frames and lights.

10. Overhead coiling doors and frames.

11. Sectional overhead doors and frames.

12. Wood.

13. Portland cement plaster (stucco).

14. Wall louvers.

15. Mechanical roof mounted equipment.

C. Substrate listings are for principal surfaces only. Refer to drawings, details and individual specification sections for items, surfaces, and substrates not specifically listed.

1.3 REFERENCES

A. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.

B. SSPC - The Society for Protective Coatings.

1.4 SYSTEM DESCRIPTION

A. Preparation of all surfaces to receive final finish.

B. Painting and finishing work of this section using coating systems of materials including primers, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

C. Surface preparation, priming, and finish coats specified in this Section are in addition to shop-priming and surface treatment specified under other Sections.

D. Painting and finishing all exterior and interior surfaces of materials including structural, mechanical, and electrical work on site, in building spaces, and above or on the roof.

E. Paint exposed surfaces except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces.

1.5 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.6 QUALITY ASSURANCE

A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with five years experience.

B. Applicator: Company specializing in commercial painting and finishing with five years documented experience.

C. Coats: The number of coats specified is the minimum number acceptable. If full coverage is not obtained with the specified number of coats, apply such additional coats as are necessary to produce the required finish.

D. Employ coats and undercoats for all types of finishes in strict accordance with the recommendations of the paint manufacturer.

E. Provide primers and undercoat paint produced by the same manufacturer as the finish coat.

F. The minimum dry film thickness of each coat of paint shall comply with the manufacturer's recommendations for each type of paint used.

1.7 REGULATORY REQUIREMENTS

A. Comply with applicable codes and regulations of governmental agencies having jurisdiction including those having jurisdiction over airborne emissions and industrial waste disposal. Where those requirements conflict with this specification, comply with the more stringent provisions.

B. Comply with the current applicable regulations of the California Air Resources Board (CARB) and the Environmental Protection Agency (EPA).

C. Comply with South Coast Air Quality Management District (SCAQMD) Rule 1113. A copy of this regulation can be obtained from http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/r1113.pdf?sfvrsn=24.

D. In the South Coast Air Quality Management District (SCAQMD), where lower VOC contents are specified for a number of categories, certain products maybe covered under the manufacturer's SCAQMD - approved Averaging Program. As a result, certain products may be fully compliant with SCAQMD Rule 1113, despite having VOC contents higher than specified limits.

1.8 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Product data for each coating type shall include as a minimum the following items. Listing shall be by manufacturer’s catalog number:

1. Solvent type.

2. Resin type and percentage.

3. Prime pigments by percent of weight.

4. Reinforcing pigment by percent of weight

5. Solids and volume by weight.

6. VOC and RAVOC limits.

7. Coverage rates and film thickness both wet and dry.

8. Conformance to environmental standards listed.

9. Surface preparation recommendations.

10. Application, storage, clean up and disposal recommendations.

11. Special instructions from the manufacturer for proper preparation and application.

C. Provide manufacturer's technical information and instructions for application of each material proposed for use by catalog number.

D. List each material by catalog number and cross-reference specific coating with specified finish system.

E. Technical data sheets and all container labels must match and shall contain the same product identification numbers. The term "Series " is not acceptable.

F. Provide manufacturer's written and signed certificate that products proposed meet or exceed specified materials.

G. Submit samples under provisions of Section 01 33 00.

H. Submit two samples 8-1/2 x 11 inch in size of each paint color and texture applied to cardboard. Resubmit samples until acceptable color, sheen and texture is obtained.

1.9 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit manufacturer’s product data for paints and coatings, including printed statement of VOC content and chemical components under the provisions of Section 01 81 13.

B. LEED Submittal: Innovation Credit. Submit manufacturer's product data for reflective coatings under provisions of Section 01 81 13.

1.10 FIELD SAMPLES

A. Provide field samples under provisions of Section 01 33 00.

B. On wall surfaces and other exterior and interior components, duplicate specified finishes on at least 100 sq.ft. of surface area.

C. Provide full-coat finishes until required coverage, sheen, color and texture are obtained.

D. Simulate finished lighting conditions for review of field samples.

E. After finishes are accepted, the accepted surface may remain as part of the work and will be used to evaluate subsequent coating systems applications of a similar nature.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site and store and protect under provisions of Section 01 61 00.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.

C. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing. Paint containers not displaying product identification will not be acceptable.

D. Store paint materials at minimum ambient temperature of 50 degrees F and a maximum of 90 degrees F, in well ventilated area, unless required otherwise by manufacturer's instructions.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.12 ENVIRONMENTAL REQUIREMENTS

A. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.

B. Minimum Application Temperature for Varnish and Urethane Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

C. Provide lighting level of 80 foot candles measured mid-height at substrate surface.

1.13 EXTRA MATERIAL

A. Provide a one gallon unopened container of each color and surface texture to Owner.

B. Label each container with color, texture, and room locations in addition to the manufacturer's label.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - PAINT

A. Unless specifically identified otherwise, manufacturer’s catalog names and numbers of paint types in this Section are based on products manufactured or distributed by the Dunn-Edwards Corporation (www.dunnedwards.com) and shall serve as the basis of design against which the Architect will judge equivalency. The quantity of titanium dioxide, the use of clays, aluminum silicate, talc and the purity of acrylic materials are a few of the criteria which will be used by the Architect in determining equivalency of materials. Therefore, Prime Pigment Content must be clearly stated on each Technical Data Sheet.

1. Products, to include colorants must not contain Silica.

2. Products: Containers Labels, and Technical data sheets must all contain the same product numbers. The word “Series” will not be accepted.

B. Subject to full compliance with specified requirements, other manufacturers offering equivalent products are:

1. Behr Process Corp., www.behrpaint.com.

2. Benjamin Moore Paints, www.benjaminmoore.com.

3. Glidden Professional, www.gliddenprofessional.com.

4. Kelly-Moore Paint Company, www.kellymoore.com.

5. Pittsburgh Paints, www.ppg.com.

6. Sherwin Williams, www.sherwin-williams.com.

7. Tnemec Company, Inc., www.tnemec.com.

8. Vista Paint Corporation, www.vistapaint.com.

C. Substitutions: Under provisions of Section 01 25 13.

2.2 ACCEPTABLE MANUFACTURERS - MULTICOLORED PAINT COATING

A. Bollen International, Inc., (Crafton), www.bolleninternational.com.

B. Dunn-Edwards Corporation (Multispec), www.dunnedwards.com.

C. Textured Coatings of America (Tex-Cote), www.texcote.com.

D. Substitutions: Under provisions of Section 01 25 13.

2.3 ACCEPTABLE MANUFACTURERS - CERAMIC EPOXY COATING

A. Tnemec Company, Inc. www.tnemec.com.

B. Vitrocem, www.vitrocem.com.

2.4 ACCEPTABLE MANUFACTURER - HEAT REFLECTIVE COATING

A. Textured Coatings of America (Tex-Cote), www.texcote.com.

2.5 MATERIALS

A. Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.

B. Good flow and brushing properties; capable of drying or curing free of streaks or sags.

C. “Deep Tone” colors to be composed of 100 percent acrylic pigments with a colored base.

D. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

E. Chemical Components of Interior Paints and Coatings: Shall not exceed the limitations of Green Seal’s Standard GS-11 and SCAQMD Rule 1113 averaging method for VOC content and the following restrictions:

1. Flat Paints and Coatings: VOC content of not more than 50 g/L.

2. Non-Flat Paints and Coatings: VOC content of not more than 50 g/L.

3. Anticorrosive Coatings: VOC content of not more than 100 g/L.

4. Varnishes and Sanding Sealers: VOC content of not more than 275 g/L.

5. Stains: VOC content of not more than 250 g/L.

6. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).

7. Silica Compounds: Paints and coatings, to include colorants, shall not contain any silica.

8. Restricted Components: Paints and coatings shall not contain any of the following:

(a) Acrolein.

(b) Acrylonitrile.

(c) Antimony.

(d) Benzene.

(e) Butyl benzyl phthalate.

(f) Cadmium.

(g) Di (2-ethylhexyl) phthalate.

(h) Di-n-butyl phthalate.

(i) Di-n-octyl phthalate.

(j) 1,2-dichlorobenzene.

(k) Diethyl phthalate.

(l) Dimethyl phthalate.

(m) Ethylbenzene.

(n) Ethylene Glycol.

(o) Formaldehyde.

(p) Hexavalent chromium.

(q) Isophorone.

(r) Lead.

(s) Mercury.

(t) Methyl ethyl ketone.

(u) Methyl isobutyl ketone.

(v) Methylene chloride.

(w) Naphthalene.

(x) Toluene (methylbenzene).

(y) 1,1,1-trichloroethane.

(z) Vinyl chloride.

2.6 FINISHES

A. Refer to schedule at end of Section for surface finish schedule.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1.	Plaster and Gypsum Wallboard	:	12 percent.
2.	Masonry, Concrete, and Concrete Unit Masonry	:	12 percent.
3.	Interior Located Wood	:	15 percent.
4.	Exterior Located Wood	:	15 percent.

D. Beginning of installation means acceptance of existing surfaces.

3.2 SURFACE PREPARATION - GENERAL

A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.

B. Remove all finish hardware from doors and frames prior to preparing surfaces or finishing.

C. Correct minor defects and clean surfaces which affect work of this Section.

D. Shellac and seal marks which may bleed through surface finishes.

E. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

G. Gypsum Board: Repair all voids, nicks, cracks and dents with patching materials and finish flush with adjacent surface. Latex fill minor defects. Spot prime defects after repair.

H. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Pretreat with phosphoric acid etch or vinyl wash. Apply coat of etching primer the same day as pretreatment is applied.

I. Concrete and Unit Masonry: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

J. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

K. Uncoated Steel and Iron: Remove grease, scale, dirt, and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint after repairs.

L. Shop Primed Steel: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime paint steel surfaces.

M. Interior Wood: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

N. Exterior Wood: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior caulking compound after prime coat has been applied.

O. Wood Doors: Seal top and bottom edges with 2 coats of spar varnish sealer.

3.3 PROTECTION OF ADJACENT WORK

A. Protect elements surrounding the work of this Section from damage or disfiguration.

B. Repair damage to other surfaces caused by work of this Section.

C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.

D. Remove empty paint containers from site.

3.4 WORK NOT TO BE PAINTED

A. Painting is not required on surfaces in concealed and inaccessible areas such as furred spaces, foundation spaces, utility tunnels, pipe spaces and duct shafts.

B. Do not paint metal surfaces such as stainless steel, chromium plate, brass, bronze, and similar finished metal surfaces.

C. Do not paint anodized aluminum or other surfaces which are specified to be factory pre-finished.

D. Do not paint sandblasted or architecturally finished concrete surfaces.

E. Do not paint prefinished acoustic materials or acoustic suspension systems.

F. Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or identifications.

3.5 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Do not apply finishes to surfaces that are not dry.

C. Apply prime coat to surfaces which are to be painted or finished.

D. Apply each coat to uniform finish.

E. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

F. Sand lightly between coats to achieve required finish.

G. Allow applied coat to dry before next coat is applied.

H. The number of coats specified is the minimum that shall be applied. Apply additional coats when undercoats, stains or other conditions show through final paint coat, until paint film is of uniform finish, color and appearance.

I. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

J. Prime back surfaces of interior and exterior woodwork with primer paint.

K. Prime back surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

L. Paint mill finished door seals to match door or frame.

M. Paint primed steel glazing stops in doors to match door or frame.

N. Cloudiness, spotting, lap marks, brush marks, runs, sags, spikes and other surface imperfections will not be acceptable.

O. Where spray application is used, apply each coat of the required thickness. Do not double back to build up film thickness of two coats in one pass.

P. Where roller application is used, roll and redistribute paint to an even and fine texture. Leave no evidence of roller laps, irregularity of texture, skid marks, or other surface imperfections.

3.6 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Paint shop primed equipment. Do not paint shop prefinished items.

B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

C. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished.

D. Replace identification markings on mechanical or electrical equipment when painted accidentally.

E. Paint exposed conduit and electrical equipment occurring in finished areas.

F. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

3.7 CLEANING

A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.

B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.8 PROTECTION OF COMPLETED WORK

A. Protect finished installation under provisions of Section 01 61 00.

B. Erect barriers and post warning signs. Maintain in place until coatings are fully dry.

C. Confirm that no dust generating activities will occur following application of coatings.

3.9 PATCHING

A. After completion of painting in any one room or area, repair surfaces damaged by other trades.

B. Touch-up or re-finish as required to produce intended appearance.

3.10 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 29.

B. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary.

C. The Owner will engage the services of an independent testing agency to sample paint material being used.

D. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.

E. The testing agency will perform appropriate quantitive materials analysis and other characteristic testing of materials as required by the Owner.

F. If test results show materials being used and their installation do not comply with specified requirements or manufacturer's recommendations, the Contractor may be directed to stop painting, remove noncomplying paint, pay for testing and repaint surfaces to acceptable condition.

3.11 COLOR SCHEDULE

A. Paint and finish colors shall be selected by the Architect from manufacturer's entire range of standard and custom color selections and special colors selected to match or compliment the colors of other materials, equipment, or components which comprise the work.

B. Access doors, registers, exposed piping, electrical conduit and mechanical/electrical panels: Generally the same color as adjacent walls.

C. Exterior and interior steel doors, frames and trim: Generally a contrasting color to adjacent walls.

D. Doors generally are all the same color, but of a contrasting color from frame and trim.

E. Exterior and interior steel fabrications: Generally a contrasting color to adjacent walls.

F. Exposed interior mechanical/ductwork: Generally a contrasting color to adjacent walls or ceiling.

G. Ceilings are generally to be painted a different color than walls.

H. A maximum of ten (10) different colors will be selected fo use in varying amounts at interior gypsum board locations.

I. Approximately 20 percent of overall painting work will be required to be "Deep Tone" colors. This work will require one additional coat of paint beyond that as specified.

3.12 SCHEDULE - EXTERIOR SURFACES

Wood - Painted (Semi-Gloss Acrylic)	
1st coat:	EZPROO EZ Prime Premium
2nd coat:	SSHL50 Spartashield
3rd coat:	SSHL50 Spartashield
Cement Plaster (Flat Elastomeric)	
1st coat:	FPSL00 Flex Prime Select

2nd coat:	EDLX10 Enduralastic 10
3rd coat:	EDLX10 Enduralastic 10

3.13 SCHEDULE - INTERIOR SURFACES

Wood - Transparent (Stain - Semi-Gloss Polyurethane)

1st coat:	V109 Stainseal - Minwax Stain Old Master Waterbase
Filler coat (Open grain wood only):	Valspar Wood Filler VSP 0109 Old Master Waterbase
2nd coat:	Cabot W.B. Polyurethane CAB 8087-1 Old Master Waterbase
3rd coat:	Cabot W.B. Polyurethane CAB 8087-1 Old Master Waterbase
4th coat:	Cabot W.B. Polyurethane CAB 8087-1 Old Master Waterbase

Steel - Primed or Unprimed (Semi-Gloss Urethane Alkyd Enamel)

1st coat:	BRPR00 Bloc-Rust Premium
2nd coat:	ASHL50 Aristoshield
3rd coat:	ASHL50 Aristoshield

Gypsum Board (Eggshell Acrylic everywhere except for wet areas)

1st coat:	VNPROO Vinylastic Premium
2nd coat:	SPMA30 Suprema
3rd coat:	SPMA30 Suprema

Gypsum Board (Semi-Gloss Acrylic at wet areas including Restrooms, Kitchen, Laundry Rooms, Custodial Rooms)

1st coat:	VNPROO Vinylastic Premium
2nd coat:	SPMA50 Suprema
3rd coat:	SPMA50 Suprema

END OF SECTION

SECTION 10 11 17

GLASS MARKERBOARDS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glass markerboards.

B. Accessories.

1.2 REFERENCES

A. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.

B. ASTM B221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.

C. ASTM A653 - Steel Sheet, Zinc-Coated, (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

D. ASTM A924 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00.

B. Indicate on shop drawings, wall elevations, dimensions, joint locations.

C. Provide product data on markerboards and accessories.

D. Submit samples under provisions of Section 01 33 00.

E. Submit two samples 11 x 11 inch in size illustrating material finish, and color, of markerboard surfacing.

1.4 MAINTENANCE DATA

A. Submit maintenance data under provisions of Section 01 77 00.

B. Include maintenance information on regular cleaning and stain removal.

1.5 WARRANTY

A. Provide one year warranty under provisions of Section 01 77 00.

B. Warranty: Include coverage for discoloration of surfaces due to cleaning, crazing or cracking and staining.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. AARCO Products, Inc., www.aarco.com.

B. Claridge Products and Equipment, Inc., www.claridgeproducts.com.

C. Clarus, www.clarus.com.

D. Deko Markerboards, www.dekomarkerboards.com.

E. Egan Visual, www.egan.com.

F. Gardner Glass Products, www.dwglassmarkerboards.com.

G. MDC, www.mdcwall.com.

H. Substitutions: Under provisions of Section 01 25 13.

2.2 MATERIALS

A. Steel Sheet: ASTM A653, Grade 33, G90 zinc coating in accordance with ASTM A924, minimum 0.0329 inches thick.

B. Aluminum Extrusions: ASTM B221, 6063 alloy, T5 temper.

C. Glass: Minimum 3/16 inch thick tempered glass meeting requirements of ANSI Z97-1. Optically clear hard coat on face, permanent opaque color on back. Polished square edges.

2.3 ACCESSORIES

A. Segmented aluminum magnetic accessory tray, 12 inches long x 3 inches deep. Claridge No. MGM-T1. Quantity: One per board.

B. Markerboard Magnet: Round. Made for glass markerboards, Color: Round clear color. Quanitity: Twelve per board.

C. Magnetic marker caddy. Quantity: One per board.

D. Magnetic eraser. Quantity: One per board.

E. Protective Cover: Sheet polyethylene, 8 mil thick.

F. Blocking Pads: Manufacturer's standard padding designed to prevent deflection.

G. Metal Mounting Clips: Z-bar hanging clips, length of board minus 3 inches.

H. Mounting: Stand off mounting method. Stainless standoff brackets with adjustable leveler screws and U shims for level, flush surfaces.

2.4 FABRICATION - GLASS MARKERBOARDS

A. Outer Face Sheet: Glass.

B. Backing Surface: Steel sheet.

C. Glass Markerboard Size: As indicated in the drawings.

2.5 FINISHES

A. Glass Color: Color as selected by Architect.

B. Aluminum Accessories: Clear satin anodized finish.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify that surfaces and internal wall blocking are ready to receive work, and dimensions are as indicated on shop drawings.

B. Beginning of installation means acceptance of substrate construction.

3.2 INSTALLATION

A. Install markerboards in accordance with manufacturer's instructions and as indicated on drawings.

B. Install blocking pads behind markerboards at 16 inches on center both vertically and horizontally.

C. Install metal Z clips at top and bottom of boards.

D. Secure units level and plumb.

E. Butt markerboard panels tight to hairline joint.

F. Markerboard configuration as indicated on the drawings.

G. Install accessories.

3.3 CLEANING

A. Clean markerboard surfaces in accordance with manufacturer's instructions.

B. Cover markerboard surfaces with protective cover, taped to frame.

C. Remove protective cover at Date of Substantial Completion.

END OF SECTION

SECTION 10 14 00

SIGNAGE

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Plastic/acrylic signs.

B. Metal signs.

C. Letters and numbers.

D. Cast metal plaques.

E. Fire wall barrier identification signs.

F. Precast Concrete Monument Sign.

1.2 REFERENCES

A. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

B. 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design.

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 01 33 00.

B. Submit shop drawings listing sign styles, lettering and locations, spacing and installation method.

C. Submit samples under provisions of Section 01 33 00.

D. Submit two samples illustrating full size sample sign, of type, style and color specified including method of attachment.

E. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

F. Include installation templates and hardware.

1.4 REGULATORY REQUIREMENTS

A. Conform to CBC - California Building Code, (CCR), Title 24, Part 2 and the 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design for accessibility requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and protect products to site under provisions of Section 01 61 00.

B. Package signs, labeled in name groups.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not install adhesive mounted signs when ambient temperature is below 70 degrees F. Maintain this minimum during and after installation of signs.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acrylic Signs:

1. Architectural Sign Identity, www.architecturalsignidentity.com.
2. ASI - Sign Systems, www.asisignage.com.
3. Best Manufacturing, www.bestsigns.com.
4. Bravo Sign and Design, www.bravosign.com.
5. CA Signs, www.casigns.com.
6. Mohawk Sign Systems, www.mohawksign.com.
7. Neiman and Company, www.neimanandco.com.
8. Signs and Lucite Products, Inc., www.signs-ca.com
9. Signtec, www.signtec.com.
10. Southwell Company, www.southwellco.com.
11. Vomar Products, Inc., www.vomarproducts.com.
12. Substitutions: Under provisions of Section 01 25 13.

B. Letters and Numbers:

1. ARK Ramos, www.arkramos.com.
2. ASI - Sign Systems, www.signage.com.
3. Bravo Sign and Design, www.bravosign.com.
4. Gemini, www.gemini.signproducts.com
5. Matthews, www.matthewssigns.com.
6. Nelson-Harkins Ind., www.nelson-harkins.com.
7. Neiman and Company, www.neimanandco.com.
8. Southwell Company, www.southwellco.com.
9. Signs and Lucite Products, Inc., www.signs-ca.com.
10. Signtec, www.signtec.com.
11. Vomar Products, Inc., www.vomarproducts.com.
12. Substitutions: Under provisions of Section 01 25 13.

C. Cast Metal Plaques:

1. ARK Ramos, www.arkramos.com.
2. Bravo Sign and Design, www.bravosign.com.
3. Gemini, www.geminisignproducts.com.
4. Matthews, www.matthewsbronze.net.
5. Signs and Lucite Products, Inc., www.signs-ca.com
6. Signtec, www.signtec.com.
7. Southwell Company, www.southwellco.com.
8. Substitutions: Under provisions of Section 01 25 13.

D. Metal and Traffic Signs:

1. Four S Company, (877) 597-1288. No URL available.
2. Signs and Lucite Products, Inc., www.signs-ca.com
3. Signtec, www.signtec.com.
4. Traffic Management Inc., www.trafficmanagement.com.
5. Substitutions: Under provisions of Section 01 25 13.

E. Precast Concrete Monument Sign.

1. Quickcrete Products Corp., www.quickcrete.com.
2. Wausau Tile, www.wausautile.com
3. Substitutions: Under provisions of Section 01 25 13.

F. Fire Wall Barrier Identification Sign:

1. Fire Wall Signs, Inc., www.firewallsigns.com.
2. Fire Safety Signs, www.mysafetysign.com.
3. Substitutions: Under provisions of Section 01 25 13.
4. Substitutions: Under provisions of Section 01 25 13.

2.2 MANUFACTURED UNITS

A. Room Control Signage: Mohawk Sign Systems, Curved Frame Series satin-frame with brushed silver end cap, M-202-9, with 1/32 inch raised border and letters with integral California round top contracted Grade 2 braille dots with dot spacing in compliance with CBC Table 11B-703.3.1 raised a minimum of 1/ 40 inch. Allow for twelve letters and three numerals for each sign. Signage to be in compliance with the requirements of Article 703 of the 2010 ADA Standards for Accessible Design and CBC, California Building Code (CCR), Title 24, Part 2, Section 11B-703. Provide and install at locations as instructed by the Architect.

B. Tactile Exit Signage: Mohawk Sign Systems, Curved Frame Series satin-frame with brushed silver end cap, M-202-9 with 1/32 inch raised border and letters with integral California round top contracted Grade 2 braille dots with dot spacing in compliance with CBC Table 11B-703.3.1 raised a minimum of 1/ 40 inch. Provide signs at locations shown on the drawings or as instructed by the Architect. Signage to be in compliance with the requirements of Article 703 of the 2010 ADA Standards for Accessible Design and CBC, California Building Code (CCR), Title 24, Part 2, Section 1011.4 and 11B-703.

C. Pictorial Symbol Signage: Mohawk Sign Systems, Series 200A, Format A Sand Carved Process, with 1/32 inch raised border and letters with integral California round top contracted Grade 2 braille dots with dot spacing in compliance with CBC Table 11B-703.3.1 raised a minimum of 1/ 40 inch. Material shall be 1/8 inch thick MP plastic plate of size indicated with lettering and symbols as indicated; adhesive and mechanical mounting with copy centered on plate. Provide sign in locations shown on the drawings. Signage to be in compliance with the requirements of Article 703 of the 2010 ADA Standards for Accessible Design and CBC, California Building Code (CCR), Title 24, Part 2, Section 11B-703.

D. Rescue Assistance Sign: Mohawk Sign Systems. Series 200A, Format A Sand Carved Process, with 1/32 inch raised letters with integral California round top contracted Grade 2 braille dots with dot spacing in compliance with CBC Table 11B-703.3.1 raised a minimum of 1/40 inch. Material shall be 1/8 inch thick MP plastic plate of size indicated with lettering indicated, mechanical mounting with copy centered on plate. Provide sign in locations as shown on the drawings. Signage shall be in compliance with requirements of Article 703 of the 2010 ADA Standards for Accessible Design and CBC, California Building Code (CCR), Title 24, Part 2, Section 11B-703.5.

E. Entrance and Restroom Signage:

1. Restroom Doors: Acrylic plastic signs equivalent to that as detailed on the drawings; 12 inch circle and triangle with international symbol of accessibility in accordance with CBC, California Building Code, (CCR), Title 24, Part 2, Section 11B-216.8 and 11B-703.7.2.6.

2. Building Entrance: Equivalent to 5 inch square, reflective decal accessible sign in accordance with CBC, California Building Code (CCR), Title 24, Part 2, Section 11B-216.6 and 11B-703.7.2.1.

F. Accessible Gate Signage: 0.080 inch thick aluminum sheet sign of size indicated. Paint with reflectorized paint. Graphics and text to be as indicated. Attach sign to adjacent fence with 12 gage wire ties at each corner. Mount sign at 5’-0” from grade to center of sign. Sign shall be in conformance with CBC, California Building Code (CCR), Title 24, Part 2, Section 11B-206.4.7 and 11B-404.1.1.

G. Fire Wall Barrier Identification Sign: 11 x 15 inch adhesive backed vinyl sign with minimum 3 inch high letters identifying wall as a fire and or smoke barrier; listing hourly rating of fire wall; with specific language stating that all openings in wall are to be protected. Sign shall be in conformance with CBC, California Building Code (CCR), Title 24, Part 2, Section 703.7.

H. Site Signage:

1. Van Parking Stall: 12 inch x 18 inch 0.080 inch thick aluminum accessible sign in accordance with CBC, California Building Code, (CCR), Title 24, Part 2, Section 11B-502.6 and 11B-703.7.2.1 with separate 12 inch wide x 4 inch high sign with "Van-Accessible" wording and additional language

below symbol of accessibility that states “Minimum Fine $250.00.” Mount on 2 inch diameter standard weight galvanized steel pipe post.

2. Auto Parking Stall: 12 inch x 18 inch 0.080 inch thick aluminum accessible sign in accordance with CBC, California Building Code, (CCR), Title 24, Part 2, Section 11B-502.6 and 11B-703.7.2.1 with additional language below symbol of accessiblity that states “Minimum Fine $250.00.” Mount on 2 inch diameter standard weight galvanized steel pipe post

3. Drive Approach: 18 inch x 24 inch 0.080 inch thick aluminum tow-away sign with local address and police phone number in accordance with CBC, California Building Code, (CCR), Title 24, Part 2, Section 11B-502.8.1. Mount on 2 inch diameter standard weight galvanized steel pipe post.

4. Do Not Enter: Custom 0.080 inch thick aluminum sign. Size and location as indicated on the drawings.

5. Fuel Shut-Off: 24 inch x 6 inch 0.080 inch thick aluminum sign as detailed.

I. Cast Plaque:

1. Material: Cast Bronze.

2. Size: 30 x 36 inches.

3. Letter Style: Helvetica medium.

4. Border Style: Double line.

5. Background Texture: Travertine.

6. Mounting Method: Boss and stud.

7. Background Color: As selected by Architect.

8. Copy: Verify with Architect.

J. Precast Concrete Monument Sign:

1. Precast concrete: Gray colored concrete.

2. Single sided. Sealed surface both sides.

3. Size: 12 feet long X 3'-0" high X 8 inches thick.

4. Text: Reverse cast lettering. Text as indicated on drawings. Painted finish.

5. Extended base: Precast concrete base of same color as sign. Sealed.

6. Reference the drawings for more information.

K. Accessories: Provide all anchors, adhesives, and accessories for a complete installation.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means installer accepts existing surfaces.

3.2 INSTALLATION - GENERAL

A. Install in accordance with manufacturer's instructions.

B. Install true, plumb, level and adequately secured to substrate.

C. Clean and polish.

3.3 INSTALLATION - FIRE BARRIER

A. Install fire wall barrier identification signs on fire walls in accessible concealed floor, floor-ceiling or attic space above accessible ceilings.

B. Install at intervals not exceeding a 30' - 0" horizontal spacing.

C. Install at maximum 15' - 0" from end of wall.

END OF SECTION

SECTION 10 28 13

TOILET ACCESSORIES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Toilet and shower, washroom accessories.

B. Framed mirror units.

C. Concealed anchor devices and backing plate reinforcements furnished to other Sections.

D. Attachment hardware.

1.2 REFERENCES

A. 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design.

B. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

C. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strips.

D. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

E. ASTM A366 - Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.

F. ASTM A386 - Zinc Coating (Hot-Dip) on Assembled Steel Products.

G. ASTM B456 - Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

H. ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

1.3 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Provide product data on accessories describing size, finish, details of function, attachment methods.

C. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

1.4 KEYING

A. Supply two keys for each accessory to Owner.

B. Master key all accessories.

1.5 REGULATORY REQUIREMENTS

A. Conform to CBC, California Building Code, (CCR) Title 24, Part 2, the 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design and for accessibility requirements.

B. Structural strength of grab bars, shower seats, fasteners and mounting devices shall conform to requirements of the CBC, California Building Code, (CCR) Title 24, Part 2, Section 11B-609, 11B-610 and shall withstand the application of a 250 lb. point load.

C. Elements of Sanitary facilities shall be mounted at locations in compliance with CBC Sections 11B-602 through 11B-612.

D. Grab bars in toilet facilities and bathing facilities shall comply with CBC Section 11B-609. Grab bars and any wall or other surfaces adjacent to grab bars shall be free of sharp or abrasive elements and shall have rounded edges. The space around the grab bars shall be as follows:

1. 1 ½" between the grab bar and the wall.

2. 1 ½" minimum between the grab bar and projecting objects below and at the ends.

3. 12" minimum between the grab bar and projecting objects above.

1.6 COORDINATION

A. Coordinate the work of this Section under provisions of Section 01 31 00.

B. Coordinate the work of this Section with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Bobrick Washroom Equipment, Inc., www.bobrick.com.

B. American Specialties, Inc. (ASI), www.americanspecialties.com.

C. Bradley Corporation, www.bradleycorp.com.

D. Substitutions: Under provisions of Section 01 25 13.

2.2 MATERIALS

A. Sheet Steel: ASTM A366.

B. Stainless Steel Sheet: ASTM A167, Type 304.

C. Tubing: ASTM A269, stainless steel, Type 304.

2.3 ACCESSORIES

A. Adhesive: Two component epoxy type waterproof.

B. Fasteners, Screws, and Bolts: Hot dip galvanized, tamperproof.

C. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.4 FABRICATION

A. Weld and grind smooth joints of fabricated components.

B. Form exposed surfaces from single sheet of stock, free of joints.

C. Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

D. Back paint components where contact is made with building finishes to prevent electrolysis.

E. Shop assemble components and package complete with anchors and fittings.

F. Provide steel anchor plates, adapters, and anchor components for installation.

G. Hot dip galvanize exposed and painted ferrous metal and fastening devices.

H. Toilet tissue dispensers located in accessible toilet rooms or stalls shall not have their flow restricted and shall be capable of continuous flow.

2.5 FACTORY FINISHING

A. Galvanizing: ASTM A123 to 1.25 oz/sq yd.

B. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

C. Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats electrostatic baked enamel.

D. Chrome/Nickel Plating: ASTM B456, Type SC 2 satin finish.

E. Stainless Steel: No. 4 satin luster finish.

F. Mirror Glass: FS DD-G-451 Type I, Class 1, Quality of 2, 1/4 inch thick with silver coating, copper protective coating and non metallic paint coating complying with FS DD-M-411.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that site conditions are ready to receive work and dimensions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site at appropriate time for building-in.

B. Provide templates and rough-in measurements as required.

C. Verify exact location of accessories for installation.

3.3 INSTALLATION

A. Install fixtures, accessories and items in accordance with manufacturers' instructions.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Accessories required to be accessible shall be mounted at heights according to CBC Section 11B-603.5 and as indicated on the drawings.

D. Toilet paper dispensers and feminine napkin dispensers located on the grab bar side of an accessible toilet room or stall shall not project more than 3 inches from the finished surface of the wall nor be located closer than 1-1/2 inches clear of the tangent point of the grab bar.

3.4 SCHEDULE

A. As indicated on the drawings.

END OF SECTION

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire extinguishers.

B. Non-rated and fire rated cabinets.

C. Accessories.

1.2 REFERENCES

A. ASTM E814 - Fire Tests of Through-Penetration Fire Stops.

B. NFPA 10 - Portable Fire Extinguishers.

C. CFC - California Fire Code, (CCR) California Code of Regulations, Title 24, Part 9.

D. Title 19, State Fire Marshal Regulations.

1.3 QUALITY ASSURANCE

A. Conform to NFPA 10 requirements.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of the CFC, Section 906, and Title 19 - State Fire Marshal Regulations, Chapter 3.

1.5 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Include physical dimensions, operational features, color and finish, mounting and anchorage details, rough-in measurements, location, and details.

C. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

1.6 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit manufacturer's product data under the provisions of Section 01 81 13, indicating the use of clean-agent fire extinguishing agent and the absence of HCFC and Halon agents.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit manufacturer's operation and maintenance data under provisions of Section 01 77 00.

B. Include test, refill or recharge schedules, procedures, and re-certification requirements.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not install extinguishers when ambient temperatures may cause freezing.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Amerex Corporation, www.amerex-fire.com.

B. J. L. Industries, www.jlindustries.com.

C. Larsen's Mfg. Co., www.larsensmfg.com.

D. Potter-Roemer, Inc., www.potterroemer.com.

E. Substitutions: Under provisions of Section 01 25 13.

2.2 EXTINGUISHERS

A. Dry Chemical Type: Equivalent to J.L. Industries Cosmic Model 10E, UL 4A:80B:C nominal capacity with multi-purpose chemical agent and inert material in enameled-steel container, with pressure-indicating gage.

2.3 CABINETS

A. Non-rated cabinets equivalent to J.L. Industries Panorama Model No. 1036P48 with ADAC flush pull.

2.4 FABRICATION

A. Form body of cabinet with tight inside corners and seams.

B. Fabricate body of fire rated cabinet of double wall construction filled with a 5/8 inch thick layer of protective fire barrier insulation.

C. Predrill holes for anchorage.

D. Form perimeter trim by welding, filling, and grinding smooth.

E. Hinge doors for 180 degree opening with continuous piano hinge. Provide nylon catch with pull handle.

F. Glaze doors with resilient channel gasket glazing.

2.5 FINISHES

A. Extinguisher: Red enamel.

B. Cabinet Trim and Door: Type 304 stainless steel with No. 4 finish.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify rough openings for cabinet are correctly sized and located.

B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install cabinets plumb and level in wall openings.

B. Secure rigidly in place in accordance with manufacturer's instructions.

C. Install fire rated cabinets in strict conformance with manufacturer's instructions and listing requirements of Warnock-Hersey.

END OF SECTION

SECTION 10 75 00

FLAGPOLES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum flagpoles.

B. Ground mount.

C. Halyards, accessories and flag.

1.2 REFERENCES

A. AAMA 611 – Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.

B. AASHTO M-36 - Corrugated Metal Culvert Pipe.

C. ASTM B241 - Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.

D. ASTM C33 - Standard Specification for Concrete Aggregate.

E. ASTM D1187 – Standard Specifications for Asphalt Based Emulsions for Use as Protective Coatings for Metal.

1.3 PERFORMANCE

A. Pole With Flag Flying: Resistant without permanent deformation, 110 miles/hr wind velocity, non-resonant, safety design factor of 1.6.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00.

B. Indicate on shop drawings, detailed dimensions, base details, anchor requirements, and imposed loads.

C. Provide product data on pole, accessories, and configurations.

D. Submit samples under provisions of Section 01 33 00.

E. Submit two samples illustrating material, color, and finish.

F. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and protect products under provisions of Section 01 61 00.

B. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.

C. Protect flagpole and accessories on site from damage or moisture.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Aabec Pole Division, Morgan Francis Co., www.morgan-francis.com.

B. American Flagpole, www.americanflagpole.com.

C. Concord Industries, Inc., www.concordindustries.com.

D. Eder Flag Manufacturing Co., Inc., www.ederflag.com.

E. Substitutions: Under provisions of Section 01 25 13.

2.2 POLE MATERIALS

A. Aluminum: ASTM B241; 6063 alloy, T6 temper.

2.3 POLE FABRICATION

A. Outside Butt Diameter: 7 inches.

B. Outside Top Diameter: 3.5 inches.

C. Wall Thickness: 3/16 inch.

D. Type: Ground set; fixed type.

E. Pole Design: Cone tapered.

F. Nominal Height: 35 ft measured from ground.

G. Halyard: Internal type with lockable winch system.

2.4 COMPONENTS AND ACCESSORIES

A. Finial Ball: Aluminum; 6 inch diameter.

B. Truck Assembly: Cast aluminum; revolving; stainless steel ball-bearings, non-fouling.

C. Flag: United States design, 5 x 8 feet standard size, 100 percent woven, two ply, spun polyester bunting.

D. Halyard: 5/16 inch diameter polypropylene, braided, white, with 1/16 inch diameter galvanized steel core.

E. Connecting Sleeves For Multiple Section Poles: Same material as pole, precision fit for field assembly of pole, concealed fasteners.

F. Flashing Collar: Spun aluminum.

G. Sand: ASTM C33, fine aggregate.

H. Bituminous paint: ASTM D1187, cold applied asphalt emulsion.

I. Elastomeric Joint Sealant: Single component neutral curing silicone sealant as specified in Section 07 92 00.

2.5 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M-36, corrugated 16 gage steel, galvanized.

B. Pole Base Attachment: 3/16 inch thick steel bottom plate with steel centering wedges. Galvanized.

C. Lightning Ground Rod: 18 inch long copper rod, 3/4 inch diameter.

2.6 GENERAL FINISHES

A. Metal Surfaces in Contact With Concrete: Asphaltic paint.

B. Finial: Gold anodized finish.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12-C22-A41, Class I, 0.7 mil minimum thickness.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

B. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

B. Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.

C. Provide forms where required by unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement.

3.3 INSTALLATION

A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.

B. Electrically ground flagpole installation.

C. Place foundation tube sleeve, center, and brace to prevent displacement.

D. Place concrete in accordance with Section 03 30 00. Vibrate concrete.

E. Trowel exposed concrete surfaces to a smooth dense finish. Provide positive slope to perimeter of base.

F. Install flagpole plumb in foundation tube sleeve.

G. Place tube seated on bottom plate between steel centering wedges and install hardwood wedges to secure flagpole in place.

H. Place and compact sand in place and remove hardwood wedges.

I. Seal top of foundation tube sleeve with a 2 inch thick layer of elastomeric joint sealant and cover with flashing collar. Secure collar in place.

3.4 TOLERANCES

A. Maximum Variation From Plumb: One inch.

3.5 ADJUSTING AND CLEANING

A. Clean surfaces.

B. Adjust operating devices so that halyard and flag function smoothly.

END OF SECTION

SECTION 11 14 60

VEHICLE EXHAUST REMOVAL SYSTEM

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Vehicle exhaust capture system.

B. Accessories.

1.2 REFERENCES

A. CCR - California Code of Regulations.

B. UBC - Uniform Building Code.

C. UL - Underwriter's Laboratories.

D. NFPA - National Fire Protection Agency.

E. AMCA - Air Movement and Control Association.

1.3 SYSTEM DESCRIPTION

A. The system shall provide 100% complete evacuation of all diesel fumes at source from startup of vehicle to point of exit. The system must provide complete coverage over entire length of bay and accommodate drive-through and back-in configurations.

B. The system must not affect personnel access to the vehicle and shall not block any doorways, exits, or aisles. The hose assembly shall not touch or drag on the bay floor.

C. The system shall not come into contact with the vehicle other than at the connection point and must not utilize the vehicle for any electrical or mechanical operation.

D. The system must continue to operate during a complete power failure. System shall discharge exhaust outside the station through a filter/scubber even in the event of a power failure.

E. The system shall under no circumstance allow exhaust leakage or bypass the nozzle.

F. All components shall be fabricated in strict accord with standards set forth in the current edition of ISO 9002. The manufacturer must be UL and CUL Certified www.ul.com/database/ and certified by the Air Movement and Control Association (AMCA) www.amca.org/search.html to ensure quality, consistency and reliability of products.

1.4 QUALITY ASSURANCE

A. Manufacturer: Company specializing in the manufacture of vehicle exhaust removal systems with minimum ten years documented experience.

B. Erector: Company authorized by manufacturer and specializing in installing vehicle exhaust removal systems with minimum ten years documented experience.

1.5 REGULATORY REQUIREMENTS

A. Conform to UBC and CCR for loads, seismic zoning and other governing criteria.

B. Product must be UL certified.

1.6 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00.
B. Indicate on shop drawings, system and component dimensions; components within assembly; system layout; anchorage and fasteners; and affected related work.

C. Submit substantiating engineering data, test results of previous testing meeting performance criteria, and other supportive data.

D. Provide product data on standard manufactured components including structural and performance characteristics.

E. Submit manufacturer's certificate under provisions of Section 01 33 00 that products meet or exceed specified requirements.

F. Submit drawings and calculations for approval as necessary to the Authority Having Jurisdiction.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate work of this Section with structural supports and mechanical systems shown on the drawings.

1.8 WARRANTY

A. Provide manufacturer's warranty under provisions of Section 01 77 00 for five years against defective materials or workmanship.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and protect products under provisions of Section 01 61 00.

2. PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Plymovent Corporation, (909) 781-1883, Chris Gerrero, Air Exchange.

2.2 RAIL MATERIAL

A. Rail Material: One-piece continuous extruded aluminum rail in a minimum length of 19 ft. (5.8 m) in an effort to reduce the points of leakage due to joints or connections. The construction profile shall be of a rectangular profile type, one-piece continuous extruded aluminum rail in a minimum length of 19 ft. (580 mm). Construction Profile: Rectangular profile with a rail height of 10 in. (254 mm) including the rubber seals, rail thickness of 0.20 inch (5 mm), width of 8-½ in. (216 mm) id. Bottom Portion of Rail: Continuous slots to accept a rubber seal. Rubber Seals: Fitted into each side of the rail and shall join in the middle. Rail Material: Aircraft aluminum alloy Type AA-6063 (ASTM B209/B209M). The rail shall allow the trolley/hose assembly to glide to the door threshold in a safe and effective manner. The extruded rail channel shall allow the whole rail to remain rigid and shall provide an area to attach bolts for splicing additional rails together for systems over 19 ft. (5.8 m) long. The overall extruded rail lengths shall be 19 ft. (5.8 m) standard. Rail System**: Equipped with a hydraulic braking system that limits travel of flex hose/trolley as the vehicle exits the building. Hydraulic Brake: Incorporated into the end cap of the suction rail.**

B. **Provide (3) VSRX- CSRE (Automatic Crab Return) Rail with 2 magnetic hose drops per rail.**

2.3 SUPPORT LEGS

A. Support Leg and Mounting Feet: Manufactured and provided by the supplier of primary exhaust removal system (Equipment Manufacturer). Leg Material: Aircraft aluminum alloy Type AA-6063 (ASTM B209/B209M). Supports shall come standard in 19 ft. (5.8 m) lengths. A minimum of one support with appropriate bracing shall be provided for every 10 linear feet (3.0 m) of rail profile. The support legs shall consist of a square tubular profile with dimensions no less than 2 inch (50.8 mm) OD X 0.1 inch (2.5 -mm) with ⅜ inch (10 mm) fastening hardware provided. Vertical Adjustable Mounting Foot: Capable of attaching the leg assembly to a ceiling with a 30 degree pitch, complete with a slider bar and 3/8 inch (10 mm) hardware necessary for

mounting the horizontal rail to the vertical leg assembly suspended from the ceiling.. Support Leg: Equipped with round tubular zinc-plated steel knee brace with pressed ends in standard lengths of 20 in. (508 mm), 30 in. (762 mm) and 72 in. (1.8 m). Angle completely adjustable to the leg support and mounted perpendicular and parallel to direction of the track. Typical Support Angle: 45 degrees from the centerline of the factory provided support leg. The standard leg shall be capable of meeting a Seismic 4 requirement. “Uni-strut”, all-thread rod, and/or chains may not be used in place of a leg assembly as sole support of the system. Vertical support and bracing shall be provided to safely secure the rail profile in accordance with building code and seismic standards which may apply. A minimum of one support with appropriate bracing shall be provided for every 10 (3 m) to 12 linear ft (3.7 m) of rail profile. The first leg will be approximately 3 to 4 ft (0.9 to 1.2 m) from the end of the track or rail.

2.4 HYDRAULIC BRAKE SYSTEM

A. Hydraulic Brake System: Incorporated into the end cap of the suction rail profile. The hydraulic brake system must incorporate a hydraulic shock capable of reducing the forward impact of 1 to 4 suction trolleys which may be installed now or in the future to the exhaust rail system. This hydraulic shock shall be secured to a steel end cap fabricated of a .156 inch (4 mm) steel plate with formed 90 degree side rails for rigidity. The end cap shall be of a black powder coated finish. The hydraulic shock shall be capable of reducing to a full stop the trolleys in less than 4 inch (102 mm), without physical damage to either the rail profile or trolley that it is stopping.

2.5 RAIL SPLICING JOINT

A. Rail Splicing Joint: Formed steel fitting equal to the internal diameter of the suction rail profile. The splice shall have a wall thickness of no less than 0.190 inch (4.8 mm) in thickness and a length of no less than 8 in. (203.2 mm) from end to end. Rail splice shall be secured using 12- 5/16 inch (8 mm) bolts and Nyloc nuts in the top and sides of the rail. Self-tapping bolts or screws are not acceptable.

2.6 DUCT CONNECTION

A. Duct Connection: A mid rail duct connection shall be made using a 6 in. (15 cm) flanged duct takeoff on the top of the rail. Duct connector shall be installed using self-drilling Tek screws.

2.7 TROLLEY ASSEMBLY

A. Trolley Assembly: Gantry type trolley with sealed bearing loaded wheels. The ventilated sliding crab is designed to run outside of the rail and can be positioned anywhere along the rail. The trolley chassis shall be steel and powder coated with a black finish. The chassis shall be fitted with a tapered suction cone. Rubber Sealing Lips: EPDM rubber sealing lip which shall contact with (5) five rollers on each side of the suction cone to minimize resistance between the suction cone and the rubber sealing lips. The suction cone transition shall be a tapered slot design which shall fit inside the suction rail profile. The tapered slot shall be equal or exceed in area the diameter of exhaust ventilation hose to which it is attached. Trolley Assembly: Equipped with rubber impact bumpers at both the front and rear of the trolley chassis to eliminate metal to metal contact which could damage the trolley assembly. There shall be a system balancer assembly provided to aid in the delivery of the hose to the exit door. Balancer Assembly: Self-adjusting weight spring tension balancer with a lifting capacity of no less than 31 pounds (14 kg). The balancer shall have a minimum diameter steel cable of .080 inch (2 mm) and have a safety link connection. Ideally, 6 in. (15 cm) of the balancer cable should be exposed when the Grabber nozzle is connected to the vehicle. **Provide a traveling crab return system (CSRE) that automatically returns the crab and hose to the rear of the drive through bay upon release of the nozzle from the vehicle’s exhaust pipe at the front of the bay.**

2.8 UPPER FLEXIBLE HOSE

A. Flexible ST (Standard Temperature) exhaust hose manufactured for the sole purpose of venting high temperature exhaust gases. Flexible Upper Hose: Designed strictly for the harsh environment of rapid response and auto-release of a vehicle exhaust tailpipe. Hose: Shall be 4 inch (100 mm) or 5 inch (125 mm) diameters with a length of 4 ft. (1.2 m), without joining or splicing connections. Hose Material: High temperature synthetic rubber impregnated into a high temperature laminated fabric with a mechanically crimped connection around a coated steel wire. This construction of hose must be capable of operating at continuous temperatures of 400˚ F (204˚ C) and intermittent temperatures of 500˚ F (260˚ C), such as are experienced when pump checks are performed inside the fire station. Protective Clip Cover: This shall be accomplished in a fashion, which eliminates any possibility of personnel coming in contact with an exposed hot metal helix and be

provided in a safety yellow color. The bend radius of the high temperature hose shall be no less than 1.5 times the diameter of hose to ensure that hot gases are not restricted as they pass through the system. Hoses utilizing an exposed metal helix will not be acceptable due to potential burn hazard and/or shock hazard from being utilized as a grounded, grounding or current carrying conductor for electromagnet connections. **No exceptions will be allowed.**

B. Optional Flexible HT (High Temperature) Upper Hose: Flexible 4 inch (100 mm) or 5 inch (125 mm) diameter by 6 ft. (1.8 m) long section of yellow and black hose identical in appearance to the mid and lower hose assembly and extending from the metal saddle to the crab hose connection. This construction of hose must be capable of transporting exhaust at continuous temperatures of 900˚ F (482˚ C) and intermittent temperatures of 1,050˚ F (566˚ C). **An independent third party test report shall be submitted with bid as proof of claim.** Wire Helix: Bound and protected in laminations of high temperature material. This shall be accomplished in a fashion, which eliminates any possibility of personnel coming in contact with an exposed hot metal wire helix. The hose shall further protect the internal wire helix from heat buildup and in turn add increased visibility to personnel. High Temperature Wear Strip: 9/16in. (14.2 mm) wide and be provided in a safety yellow color. Hoses utilizing an exposed metal helix will not be acceptable due to potential personnel burn hazard. **No exceptions will be allowed.**

2.9 MID HOSE

A. ST (Standard Temperature) Mid Hose: Designed strictly for the harsh environment of rapid response and auto-release from a vehicle exhaust tailpipe. Semi rigid hose: Shall be 4 in. (100 mm) or 5 in. (125 mm) diameter by 10 ft. (3 m) long section of yellow and black hose identical in appearance to the lower hose assembly and extending from the metal saddle to the SDCH. Hose Material: High temperature synthetic rubber impregnated into a high temperature laminated fabric with a minimum overlapping thickness of 2 7/16 in. (62 mm). This construction of hose must be capable of operating at continuous temperatures of 400˚ F (204˚ C) and intermittent temperatures of 500˚ F (260˚ C), such as are experienced when pump checks are performed inside the fire station. **An independent third party test report shall be submitted with bid as proof of claim.** Wire Helix: Bound and protected in laminations of hose winding. This shall be accomplished in a fashion, which eliminates any possibility of personnel coming in contact with an exposed hot metal helix. The hose shall further protect the internal wire helix from heat buildup and in turn add increased visibility to personnel. Wear Strip: 9/16in. (14.2 mm) wide and be provided in a safety yellow color. Hoses utilizing an exposed metal helix will not be acceptable due to potential burn hazard and/or shock hazard from being utilized as a grounded, grounding or current carrying conductor for electromagnet connections. **No exceptions will be allowed.**

B. Optional HT (High Temperature) Mid Hose: Designed strictly for the harsh environment of rapid response and auto-release from a vehicle exhaust tailpipe. Flexible hose: Shall be 4 inch (100 mm) or 5 inch (125 mm) diameter by 10 ft. (3 m) long section of yellow and black hose identical in appearance to the lower hose assembly and extending from the metal saddle to the SDCH. This construction of hose must be capable of transporting exhaust at continuous temperatures of 900˚ F (482˚ C) and intermittent temperatures of 1,050˚ F (566˚ C). **An independent third party test report shall be submitted with bid as proof of claim.** Wire Helix: Bound and protected in laminations of high temperature material. This shall be accomplished in a fashion, which eliminates any possibility of personnel coming in contact with an exposed hot metal wire helix. The hose shall further protect the internal wire helix from heat buildup and in turn add increased visibility to personnel. High Temperature Wear Strip: 9/16in. (14.2 mm) wide and be provided in a safety yellow color. Hoses utilizing an exposed metal helix will not be acceptable due to potential personnel burn hazard. **No exceptions will be allowed.**

2.10 LOWER HOSE ASSEMBLY

A. ST (Standard Temperature) Lower Hose: Rigid 4 in. (100 mm) or 5 in. (125 mm) diameter by 2 ft. (610 mm) long section of yellow and black hose identical in appearance to the mid hose. This construction of hose must be capable of operating at continuous temperatures of 400˚ F (204˚ C) and intermittent temperatures of 500˚ F (260˚ C) such as are experienced when pump checks are performed inside the station. An independent third party test report shall be submitted with bid as proof of claim. Supports the magnetic connection nozzle and stainless steel reducing elbow in a rigid fashion to allow for the operator to place hose collection nozzle onto the tailpipe without bending over. The lower hose is the only section of hose which shall disconnect from the upper hose assembly and act as a safety disconnect in the unlikely event the nozzle gets entangled. Hoses utilizing an exposed metal helix will not be acceptable due to potential burn hazard. No exceptions will be allowed.

B. Optional HT (High Temperature) Lower Hose: Semi rigid 4 in. (100 mm) or 5 in. (125 mm) diameter by 2 ft. (610 mm) long section of yellow and black hose identical in appearance to the upper hose. This construction of hose must be capable of transporting exhaust at continuous temperatures of 900˚ F (482˚ C) and intermittent temperatures of 1,050˚ F (566˚ C). An independent third party test report shall be submitted with bid as proof of claim. Wire Helix: Bound and protected in laminations of high temperature material. This shall be accomplished in a fashion, which eliminates any possibility of personnel coming in contact with an exposed hot metal wire helix. The hose shall further protect the internal wire helix from heat buildup and in turn add increased visibility to personnel. High Temperature Wear Strip: 9/16in. (14 mm) wide and be provided in a safety yellow color. Shall support the magnetic collection nozzle and stainless steel reducing elbow in a semi rigid fashion to allow for the operator to place hose collection nozzle onto the tailpipe without bending over. The lower hose is the only section of hose which shall disconnect from the upper hose assembly and act as a safety disconnect in the unlikely event the nozzle gets entangled. Hoses utilizing an exposed metal helix will not be acceptable due to potential personnel burn hazard. No exceptions will be allowed.

2.11 SAFETY DISCONNECT COUPLING HANDLE

A. Safety Disconnect Coupling Handle (SDCH): An injection molded composite body with a 4 inch (100 mm) or 5 inch (125 mm) diameter hose connection. A 360 degree rubber bumper to protect the vehicle and disconnect from wear shall be incorporated in the design of the system. The rubber bumper must be able to be gripped comfortably, even while wearing gloves, and the operator should be able to stand upright to connect the nozzle, thus limiting the risk of exposure to exhaust fumes. Coupling: Consists of a aluminum inner flange collar connected by a patented easy reconnect mechanism. The release tension of this device shall be preset at 102 pounds of force (450N) and easily reconnected with only 3 pounds of force (13N).

2.12 COLLECTION NOZZLE ASSEMBLY

A. Collection Nozzle Assembly: Provides a substantially air tight seal around exhaust tail pipe when connected thus allowing for virtually 100% source capture. The seal shall limit escape of life threatening exhaust gases.

B. The Magnetic Nozzle shall be engineered and designed with rare earth magnets that are strategically positioned on the face of the collection nozzle. The Magnetic Nozzle shall be coated with a galvanized finish or the optional Black-Armor version high temperature, wear and corrosion resistant duplex coating, to limit the effects from corrosive road treatment chemicals. The collection nozzle shall also incorporate a protective rubber safety cover to avoid damage to vehicle and surroundings. The magnets shall only make contact with the face of the tailpipe adapter located on the tailpipe. The reducing elbow that connects the flexible hose to the collection nozzle shall be fabricated using continuous welded construction and shall be made from polished 304 stainless steel. The angle of transition shall be no less than or greater than 67 degrees from the centerline of the reducer. The stainless steel reducer shall incorporate a primary expanded metal debris screen, which is permanently affixed by weld joints to the inside opening of collection nozzle. The collection nozzle shall be connected from a upright standing position by the user without bending over. Since this item is a point of safety for both personnel and the system itself. **No exception will be allowed.**

C. The standard conical tailpipe adapter shall be plated with a galvanized finish to limit corrosion from corrosive road treatment chemicals. The conical tailpipe adapter shall be of a self-aligning “Click and Seal” design for aiding in the connection and release of the collection nozzle from the fire apparatus.

D. The optional Top Grade conical tailpipe adapter shall be constructed from a high temperature, corrosion resistant, magnetic stainless steel, to limit the effects from extremely aggressive corrosive road treatment chemicals. The conical tailpipe adapter shall be of a self-aligning “Click and Seal” design for aiding in the connection and release of the collection nozzle from the fire apparatus.

2.13 HOSE SADDLE

A. Metal Hose Suspension Saddle: Fabricated of steel and powder coated with a black matte finish specifically manufactured for the sole purpose of suspending high temperature exhaust ventilation hose in a rapid response and auto-release application. The design of the saddle shall smoothly transition the direction of the hose during its travel along the track. Securing clamps shall be provided including a link fastener, for the purpose of attaching it to the balancer.

2.14 ELECTRICAL CONTROLLERS

A. Controller: Built and supplied by a UL and CUL recognized and listed exhaust system manufacturer. Controller shall carry the UL and CUL listing label as an “Enclosed Industrial Control Panel.” Individual components

listed by UL and CUL shall not satisfy the above requirement. Manufacturer shall undergo quarterly inspections by UL to verify all requirements and standards are met as outlined by UL and CUL. The controller shall be delivered as an Operating System Three series controller or an approved equal to the specifications to follow.

B. Electrical Controllers: Bear a visible UL and CUL listing label as proof of subscribership and shall be validated by UL www.ul.com/database/ as an "Enclosed Industrial Control Panel". Certification documents shall accompany bid documents.
   1. Manufacturer Name: _____
   2. UL File No.: _____
   3. Electrical controller and manufacturer shall be recognized and listed by UL and CUL. Controller shall be manufactured in accordance with Underwriters Laboratories standard UL-508A for "Enclosed Industrial Control Panels". The electrical controller shall include a Class 1 limited energy control circuit. Enclosures shall be NEMA 12 rated and UL listed as Type 12. The electrical control components shall be provided and mounted in an electrical enclosure to restrict access to internal components of the controller by authorized personnel only.

C. Controller Performance: Designed to sense the output pressure and/or temperature change inside the ductwork system, which is normally generated by any internal combustion engine designed to propel a motor vehicle. The operating logic shall be designed to complete this cycle. At any point in time when a collection device is connected to a motor vehicle's exhaust tailpipe, as the operator starts the vehicle, the controller shall automatically sense the engine's output pressure or temperature of the exhaust and in turn energize the electrical contractor which will supply power to the AMCA certified spark resistant fan. Through the use of an adjustable timer the controller shall keep the contactor energized for up to sixty minutes in accordance with the stations response requirement. If the responding vehicle does not disconnect from the exhaust ventilation system in less than the designated setting, the optional temperature override switch shall override the time delay to ensure continuous system operation. This automated function will work for as long as the exhaust gas temperature is in excess of the setting on the heat sensor located in the ductwork system. This cycle shall not allow the electrical contractor, which energizes the exhaust fan, to short cycle or stop the fan while the system is connected to an operating vehicle.

D. Motor Control Contactor: Allen Bradley Industrial Electrical Contactor 100C series. The contactor shall be UL - CUL listed as an approved component.

E. Motor Control Overload Relay: Allen Bradley 193 E1 Plus series. Overload relay shall have an adjustable trip range to meet the proper full load amperage of the blower motor.

F. Soft Touch Controls: Incorporated on the face or the access door of the controller by the use of an adhesive backed Lexan membrane type label to prevent water infiltration, which would void the NEMA 12 rating. Label: Provided and secured permanently to the exterior of the electrical controller. Label: Includes the name of the manufacturer, address, telephone number, user instructions and any warnings or cautions required by Underwriters Laboratories.
   1. Auto Start: This mode of operation shall be strictly for normal day to day use, as it would apply to receiving an emergency call and leaving the station. Any one or combination of the three devices listed below in Paragraph K shall activate the system. The system shall maintain itself in the Auto Start mode and always return there after the Stop sequence has been initiated. The controller shall not have a permanent off position due to the potential health hazards of diesel exhaust components.
   2. Stop: This mode of operation shall be a system override to shut down the system manually. Upon activating this mode of operation the exhaust system blower shall shut down. After a period not to exceed three seconds the controller shall automatically return to the Auto Start ready mode. This shall be a safety feature to prevent a potential health hazard from carcinogenic diesel exhaust leakage from systems having an undesirable open nozzle.
   3. Manual Run: This mode of operation shall be a system override to run the exhaust system blower continuously for the purpose of running the vehicles indoors for equipment checks during inclement weather. Upon activating this mode of operation the exhaust system blower shall start and run continuously until the Stop mode is activated at which point the system will automatically return to the Auto Start ready mode within a maximum three second time period.

G. System Indicator LED's: Show system status at all times.
   1. Auto Start Indicator: Indicate the system is in the fully automatic mode of operation and that power is on to the controller.
   2. Fan On Indicator: Indicate that power is being applied to the system blower and the controller is operating normally.

3. Filter Status Indicator: Indicates, if flashing, excessive pressure loss across the optional filter bank media. Consequently the filter must be serviced to maintain optimum efficiency of the system.
4. Stop Indicator: Indicate the fan has been manually de-energized and will return to the Auto Start ready sequence in less than three seconds to prevent the system blower from being left in the Off mode.
5. Manual Run Indicator: Indicate the fan is operating in a continuous run mode until interrupted by the stop mode activation.

H. Controller Transformer: UL listed industrial control circuit transformer sized to properly supply all components so that only one transformer shall be required. Transformer shall be provided with multi-tap primary for 115, 208, 240, 277, 400, 480, and 600 VAC, and 24 VAC secondary operating on 50 or 60 HZ with a capacity of 35 volt amperes.

I. Control Circuit Protection: By the use of primary and secondary fuses to meet UL and CUL requirements. The primary shall be protected by a pair of FLQ style fuses. A single GMA style glass fuse rated at 3.15 amps at 250V shall protect the secondary side of the control circuit.

J. Electronic Control Circuit Card: Solid state printed circuit board. The soft touch controls shall be an integral part of the control circuit card. The control circuit card shall utilize a potentiometer to adjust the length of the timing cycle up to 60 minutes. It shall incorporate several different modes of operation and optional features.

K. Activation Devices:
1. Engine Start Switch: An engine pressure sensing type, capable of recognizing the output pressure of any type of motor vehicle exhaust. The electrical contact shall be dry type and not to exceed 24VAC. There shall be one sensor per vehicle.
2. Optional Thermal Start Switch: Temperature sensing switch of the snap disc type and adjustable from 90˚ F (32˚ C) to 130˚ F (55˚ C) to configure the system based on different exhaust temperatures. There shall be one sensor per vehicle if chosen.
3. Optional Wireless Transmitter and Receiver System: Shall be an optional feature operating on a 2400 MHz frequency. Complies with FCC rule part 15, FCC ID: UY124. The receiver shall utilize 3 independent channels of control and capable of supporting up to 60 transmitters. The receiver shall operate on 12-24 VAC or VDC and enclosed in a non-metallic enclosure with a clear see through lid to view system supervisory functions. The transmitter shall be programmable and shall be powered by a 3 year battery for ease of replacement and cost savings. The transmitter shall have an open field range of 1000 ft. (305 m) and shall be initiated by a NO contact closure such as from a pressure switch mounted on the traveling exhaust system trolley or a vehicle powered ignition transmitter mounted in the vehicle.

L. Clean Filter Indicator Alarm: Used in conjunction with an optional Unifilter for filtering diesel exhaust particulate before release to the atmosphere. The clean filter indicator shall monitor the pressure loss across the filter bank media. Once the useful life of the filter has been depleted the pressure differential switch will signal a high-pressure loss and flash the “Fan On” indicator while the exhaust blower is running.

M. Optional System Monitor: Shall be an optional feature to monitor the system and advise when a preset number of emergency runs or run time on the system have accrued.

N. Optional No Airflow Alarm: Shall be an optional feature to monitor the system and advise when the exhaust fan is not functioning properly.

O. Optional Carbon Monoxide Alarm: Shall be an optional feature to monitor the carbon monoxide levels inside the apparatus bay area.

P. Electrical Wiring: Run in wire channel to allow for easier identification of the wiring circuits and for a neat appearance. All wiring circuitry shall meet National Electric Code and UL and CUL standards for proper size, bending radiuses and terminations.

Q. Electrical Terminal Block: 600 V, UL and CUL rated and recognized. It shall provide individual connection points for remote controls, clean filter indicator and power connections. The primary and secondary control wiring fuses shall be incorporated into the terminal block as one unit.

R. Product Manual: Shall be provided with each electrical control box supplied. The product manual shall include a description of components with part numbers inclusive to the controller. It shall include a wiring schematic showing all internal circuitry as well as all field installed wiring connections to the controller.

S. Electrical Interference: To protect the apparatus and communications, designs that allow any possibility of electrical back-feed or induced current which may interfere with a central services communication or onboard vehicle computer logic or navigational equipment will not be accepted.

2.15 ELECTRICAL SYSTEM

A. Station Electric Supply Panel: The power circuit for the “Emergency Response Vehicle Exhaust Removal System” shall originate in a circuit breaker panel board of the appropriate size to handle the load. Fan circuit shall be supplied by a UL listed, HACR rated circuit breaker (HACR rating is specifically for motor type loads) of the same type as indicated by the manufacturer of the circuit breaker panel or a dual element time delay fuse for fuse style panels. The circuit shall be clearly marked on an engraved ledger plate or in ink on the panel schedule as “Emergency Response Vehicle Exhaust Removal System”.

B. OS-3 Automatic Controller: Built and supplied by a UL recognized and listed exhaust system manufacturer. Controller shall carry the UL - CUL listing label as an “Enclosed Industrial Control Panel”. Individual components listed by UL shall not satisfy the above requirement. Manufacturer must undergo quarterly inspections by UL to verify all requirements and standards are met as outlined by UL and CUL. The controller shall be delivered as an Operating System Three series controller or an approved equal to the specifications in 2.16 Electrical Controllers. The controller shall be mounted 6 ft. (1.8 m) to the top of the cabinet AFF (above finished floor). A safety disconnecting means must be within sight of the controller for servicing and for safety reasons. If the supply panel is not within sight, a separate disconnecting means is required beside the controller (per NEC Code 2020). Safety disconnect shall be capable of being locked in the off position to follow lockout, tag out procedures. Provide Model OS-3 Control box for the SAF 585 536 7.5HP Fan 3PH.

C. Power Wiring Conduit: Minimum of EMT utilizing fittings for damp locations such as apparatus wash down areas (per NEC Code 2020). Conduit shall be supported with a conduit strap every 10 ft. (3 m) and within 3 ft. (1 m) of each box or termination, (per NEC Code 2020).

D. Power Wiring from Supply Panel to OS-3: THHN stranded copper wire consisting of a flame retardant, heat-resistant thermoplastic insulation with a nylon jacket for abrasion, gas, and oil resistance and rated up to 600 volts or similar.

E. Low Voltage Control Wiring: Minimum of a 16/2 multi-conductor cable to meet UL standards for the controller’s low voltage field wiring.

F. Low Voltage Control: Encased in a minimum of ½ inch (12.7 mm) EMT from the OS-3 Controller to the attic or building steel where it shall terminate with a EMT connector with a threaded plastic bushing. Conduit: Supported with a conduit strap every 10 feet (3 m) and within 3 ft. (1 m) of each box or termination (per NEC Code 2020). The 16/2 multi-conductor cable shall be supported by the building structure and ran in a manner that the cable will not be damaged by normal building use (per NEC Code 2020), securely fastening it with nylon tie wraps every 24 in. (610 mm) to 36 in. (914 mm). Draping of the cable perpendicular to building steel or support members will be unacceptable.

G. Power Wiring from OS-3 to Fan Motor: Minimum of EMT utilizing compression type fittings for damp locations such as apparatus wash down areas (per NEC Code 2020). Conduit shall be supported with a conduit strap every 10 ft. (3 m) and within 3 ft. (1 m) of each box or termination (per NEC Code 2020). Conduit shall extend through the outside wall through a hole of the proper size and terminate directly into the back of the safety disconnect with the appropriate connector and sealed with a silicon sealer or cement mortar. (Using fan model number select appropriate wire from Table 1-1).

H. Fan Safety Disconnect: Non-fusible, NEMA 3R rated for wet locations, mounted adjacent to the AMCA Certified blower. Safety disconnect shall be capable of being locked in the off and on position to follow lockout, tag out procedures (per NEC Code 2020).

I. Liquid Tight Flexible Metal Conduit: UL listed liquid tight flexible metallic conduit (Sealtite). Conduit will encase the load wires and ground wire from the safety disconnect switch to the blower motor. Conduit length not to exceed 4 ft. (1.2 m) from disconnect to blower motor. The appropriate listed terminal fittings shall be used (per NEC Code 2020).

J. Spark Resistant Blower: AMCA certified, designed and installed as a direct drive spark resistant blower. The motor shall meet current EPACT standards for energy savings. Fans utilizing belt drives and steel impellers will not be accepted.

K. Optional Temperature Switch: One for each apparatus connected to the system. The temperature switch shall be of the snap disc type and adjustable from 90˚ F (32˚ C) to 130˚ F (54˚ C). It shall be mounted on the ductwork or on the trolley by drilling a 1 inch (25 mm) hole, sealing the switch with silicone sealant and securing with 2 self-drilling screws. Can be used in conjunction with the optional wireless control system. Electrical connection shall be made with terminals provided or solder less type such as Thomas & Betts part no. 14RB-2577 or equivalent.

L. Pressure Switch: One for each apparatus connected to the system. The pressure switch shall operate at a maximum of 24VAC, pre-calibrated at .18 in. of water column. Mounting shall be accomplished by drilling a ⅜ inch (9.5 mm) hole into the aluminum rail profile and thread the hole with a ⅛ inch NPT tap, then thread the switch into the rail. For wireless systems, mounting shall be accomplished by drilling a ⅜ inch (9.5 mm) into the hose connection of the trolley and threading the switch into the hole. The electrical connections shall be made with a 0.020 inch (.5 mm) by 0.187 inch (4.8 mm) female quick disconnect terminals, such as Thomas & Betts part no. 14RBD-18277 or equivalent.

2.16 AIR MOVING DEVICES

A. Centrifugal Fans: Direct drive centrifugal type, high pressure, single width, single inlet as required or indicated. Impeller Wheels: Radial design or backward incline for performance, spark resistant and made of a nonferrous material to prevent static electricity build up. The impeller shall be dynamically and statically balanced and of the non-overloading type to provide maximum efficiency while achieving quiet, vibration-free operation. The fan housing shall be manufactured from an epoxy powder coated galvanized steel or nonferrous material. The outlet configuration shall be top horizontal, bottom horizontal, or up blast. The housing shall be capable of field reconfiguration in the event the mounting position needs to be changed for unforeseen reasons. The exhaust discharge outlet shall be in compliance with International Mechanical Code and ACGIH recommendations (min. of 36 in. (1 m) above roofline). Air intakes, windows, cascade systems, prevailing currents, communication equipment and building aesthetics shall be considered in the final location of the fan. For aesthetic reasons the fan motor and assembly shall be mounted on an epoxy powder coated galvanized steel mounting base to prevent rust stains on the exterior of the building. Belt driven fans are unacceptable due to maintenance reasons and the potential for the fan to be left non-operational without warning.

B. Fan Motor and Bearing: All 1/2 horsepower (373 watts) to 15 horsepower (11 kW) motors shall be totally enclosed fan cooled (TEFC) continuous duty rated. The motors shall be dual voltage where applicable. Motors shall comply with the government mandated “Energy Policy and Conservation Act” (EPACT) as outlined by the Department of Energy. The bearings shall be self-aligned, ball bearing type permanently sealed and lubricated. Provide(1) SAF-585 (208v) 536 7.5HP fan 3PH with sound absorbing enclosure.

C. Performance: Lengths of ductwork, hoses, elbows, branches, wyes, etc. which increase the static pressure of the system, shall be taken into account to properly size the fan. The delivered volume shall be calculated taking into account the static regain of the vehicles engine exhaust (based on a virtually airtight connection at the tailpipe). The manufacturer’s provided fan(s) shall be performance guaranteed by AMCA certification.
   1. Required Fan Capacity: The Fan Capacity shall be sized as such as to deliver the required CFM at each hose drop to which the vehicle is attached.
      a. The 4 inch (100 mm) hose system shall be designed to deliver a minimum of 340 CFM (577 m³/h) at a velocity of 4500 FPM (23 m/s) at the hose and nozzle connection.
      b. The 5 inch (125 mm) hose system shall be designed to deliver a minimum of 540 CFM (917 m³/h) at a velocity of 4500 FPM (23 m/s) at the hose and nozzle connection.

D. Location: The preferable fan location shall be on the outside of the fire station as far away from any living quarters as possible so that firefighters would not be disturbed by the system activation. No blower fans shall be mounted inside the fire station. Silencers shall be provided when fan sound pressure level exceeds 64 dBA.

2.17 DUCTWORK SYSTEM

A. Ductwork Type and Materials: UMC Class 2 or SMACNA Class II product conveying duct, meet or exceed criteria for construction and performance as outlined in Round Industrial Duct Construction Standards, SMACNA. Materials of construction unless otherwise specified for all ductwork and fittings shall be a minimum G-90 galvanized sheet metal (ASTM A653/A653M). Only when specified, Type 304 stainless steel (ASTM A240/A240M) shall be provided.

B. Ductwork Sizing and Gauges: Round pipe construction, with the range of available sizes not to exceed 16 in. (406 mm) in diameter. Duct gauge shall depend on diameter and a minimum operating pressure of 8 in. of

water gauge (1993 Pa). Acceptable Gauge and Reinforcement Requirements: Inner duct diameter 4 in. (101 mm) through 11 in. (279 mm) diameter shall be 22 gauge standard pipe (International Mechanical Code).

C. Ductwork Fittings: Round and have a wall thickness 2 gauges (one even gauge number) heavier than the lightest allowable gauge of the downstream section of duct to which they are connected (International Mechanical Code). Air Duct Branch Entrances: Factory fabricated fittings or factory fabricated duct /tap assemblies. Fittings: Constructed so that air streams converge at angles no greater than 45 degree (International Mechanical Code). All Seams: Continuous stitch welded and if necessary internally sealed to ensure air tightness. Turning elbows shall be stitch-welded and used for all diameters and pressures. They shall be fabricated of 24 gauge galvanized steel and constructed as two piece with continuous welded seam construction fittings similar to those provided by Lindab Inc. Tapered Body Fittings: Used wherever particular fallout is anticipated and where air flow is introduced to the transport duct manifold.

D. Ductwork Design Velocities: Minimum of 3500 FPM (18 m/s) to 4000 FPM (20 m/s) transport velocity. Capture Velocity: 4500 FPM (23 m/s) to 5500 FPM (28 m/s) to extract virtually 100 percent of the exhaust gases.

E. External Ductwork: Sized for the exact inlet and outlet of the exhaust fan blower. An exhaust rain cap shall be supplied and manufactured in accordance with EPA standard for free draft rain cap requirements. Included as an integral part of this rain cap shall be a back draft damper to provide protection from rain and other inclement weather.

F. Exhaust Penetrations: The core drilling shall be properly sized to reduce the diameter of the opening to the smallest possible size.

3. PART 3 EXECUTION

3.1 INSTALLATION

A. Install vehicle exhaust system in accord with manufacturer’s written instructions, original design and referenced standards.

3.2 MANUFACTURER'S FIELD SERVICES

A. Provide manufacturer's field services under provisions of Section 01 43 00.

B. Include services of certified technician to supervise installation, adjustments, final connections, and system testing.

C. Provide operation, maintenance instructions, and crew training to Owner as required.

END OF SECTION

SECTION 11 90 00

MISCELLANEOUS EQUIPMENT

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Dryer

B. Washer

C. Dishwasher

D. Ice Maker

E. Microwave

F. Refrigerator

G. Under Counter Refrigerator

H. Trash Can

I. Coffee Maker

J. Geargrid – Lockers

K. Hose Rack

L. Exercise Equipment

M. Dining Table

N. Dining Chairs

O. Conference Table

P. Conference Chairs

Q. Office Chair 1

R. Office Chair 2

S. Recliner

T. Glass Board

U. TV Brackets

V. 85” TV

W. 32” TV

X. 55” TV

Y. Outdoor Table

Z. BBQ

AA. Range and accessories

BB. Range Hood and accessories

CC. Oscillating Fan

DD. Hose Tower

EE. Bike Rack

FF. Solatube

GG. Emergency Phone Line Powered

HH. Emergency Phone VoIP

II. Knox Key Switch and Recessed Key Box

JJ. Temporary Site Structures

KK. Removable/Bollard Cover

LL. Shower Door

MM. Mattress

NN. Computers

OO. Substitutions: Under provisions of Section 01 25 13

1.2 REFERENCES

A. 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design.

B. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

1.3 SUBMITTALS

A. Submit all items as part of one submittal.

B. Submit product data and manufacturer's installation instructions for each item under provisions of Section 01 33 00.

1.4 REGULATORY REQUIREMENTS

A. Conform to CBC, California Building Code, (CCR), Title 24, Part 2 and the 2010 ADA Standards for Accessible Design for accessibility.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 01 77 00.

2. PART 2 PRODUCTS

2.1 PRODUCTS

A. Dryer: Speed Queen, www.speedqueencommercial.com. Model SDGMNRGS113TW01, Black Color. One (1) required in Room 123.

B. Washer: Speed Queen, www.speedqueencommercial.com. Model SWNMN2SP115TW01, Black Color. One (1) required in Room 123.

C. Dishwasher: GE Appliances, www.geappliances.com. Model PDT715SYV, GE Profile Series Stainless Steel Interior Dishwasher with Hidden Controls. Color to be selected from manufacturer's complete range by Architect. Two (2) required in Room 116.

D. Ice Maker: Ice-O-Matic, www.iceomatic.com. Model #CIM0430 – B55, Elevation Series Cube Ice Maker. Color to be selected from manufacturer's complete range by Architect. One (1) required in Room 122.

E. Microwave: GE Appliances, www.geappliances.com, Model#PCSST22U1WSS, GE Profile 2.2 Cu. Ft. Countertop Sensor Microwave Oven. Color to be selected from manufacturer's complete range by Architect. One (1) required in Room 116.

F. Refrigerator: GE Appliances, www.geappliances.com. Model #PYD22KYN, GE Profile Series 22.1 Cu. Ft. Counter-Depth French-Door Refrigerator with Door in Door. Color to be selected from manufacturer's complete range by Architect. Three (3) required in Room 116.

G. Under Counter Refrigerator: GE Appliances, www.geappliances.com. Model #GCE06GSHSB, GE Spacemaker Compact Refrigerator. Color to be selected from manufacturer's complete range by Architect. One (1) required in Room 135.

H. Trash Can: Uline, www.uline.com. Model #H-3493, Square Brute Trash Cans, Rubbermaid; 40 gallon. Color to be selected from manufacturer's complete range by Architect. Verify quantity with Architect. Location as indicated on drawings.

I. Coffee Maker: BUNN, www.bunn.com. Model CWTF35-3L (3 Lower Warmers). Coffee Maker with Lower Warmers; include two servers. Model #42401.0101, BUNN 64oz Orange Handle Glass Decanter (Single Pack). Model#42400.0101, BUNN 64oz Black Handle Glass Decanter (Single Pack). Color to be selected from manufacturer's complete range by Architect. One (1) in each room for a total of two (2) in Rooms 116 and 135. Number of decanters to equal number of burners.

J. Lockers: GridGear, www.gridgear.com. Wall Mount Locker, "Jumbo" size – 24"W x 20"D x 74 ½"H. Color to be selected from manufacturer's complete range by Architect. Twenty (20) complete assemblies required in Room 127.

K. Mobile Hose Cart: Ready Rack, www.readyrack.com. Model #HC-96-3T, Three tier unit, holds up to 3000' of 2 ½" hose size 104" x 34" x 87". Color to be selected from manufacturer's complete range by Architect. One (1) required in Room 127.

L. Exercise Equipment

1. Standard Equipment: Rogue, www.roguefitness.com

   a. Rogue FM-6 Twin Functional Trainer: Model # RF0999-100-43-FBS6-C2476. Twin Functional Trainer, 43" D x 100" H, with the added shrouds, textured black, front pull up bar curl bar with sockets, Monster 2" Sandwich J-Cup Pair, and Monster 43" Flip-down Safeties (pair). Color to be selected from the manufacturer's complete range by Architect. Complete assembly is required in Room 129, the Exercise Room.

   b. Stepr Pro: Model # STR0004, StepR Pro. Color and Finish Material to be selected from manufacturer's complete range by Architect. One (1) complete assembly is required in Room 129, the Exercise Room.

   c. Concept 2 SkiErg: Model # C2-PN2715-US, Concept 2 Wall Mounted SkiErg with PM5. Factory Finish. One (1) complete assembly is required in Room 129, the Exercise Room.

   d. Tier Mass Storage System: Model # RF0319-KB-KB, 3-Tier Mass Storage System – 43", with one (1) "Bumper/Medball Shelf" and Two (2) "Kettlebell Tray". Factory Finish. One (1) complete assembly is required in Room 129, the Exercise Room.

   e. Vertical Plate Tree: Model # RF0644, Rogue Vertical Plate Tree 2.0. Factory Finish. One (1) complete assembly is required in Room 129, the Exercise Room.

f. Belt & Band Hanger: Model # RA0995, Rogue Belt and Band Hanger, 10 Prongs, 8” Depth, and 5.5LB total weight. Factory Finish. One (1) complete assembly is required in Room 129, the Exercise Room.

g. Rogue Adjustable Bench 3.0: Model # RF0959-BLACK-MG-TXT-FP, Rogue Adjustable Bench 3.0, standard version. Color and Finish Material to be selected from manufacturer’s complete range by Architect. Two (2) assemblies required, in Room 129, the Exercise Room.

h. Butcher V2: Model # RF0553, Rogue Butcher V2. Factory Finish. One (1) complete assembly is required in Room 129, the Exercise Room.

2. Supplemental Equipment: Rogue, www.roguefitness.com

a. FM-6 Twin Functional Trainer: Model # RF1041-BE, Moster Socket Pull-up Bar Curl Bar – w/ Sockets. Color, Size and Finish Material to be selected from manufacturer’s complete range by Architect. Complete assembly is required in Room 129, the Exercise Room.

b. FM-6 Twin Functional Trainer: Model # RA1638-BLACK-MG, Monster 2” Sandwich J-Cup Pair. Color, Size and Finish Material to be selected from manufacturer’s complete range by Architect. Complete assembly is required in Room 129, the Exercise Room.

c. FM-6 Twin Functional Trainer: Model # RA0106-BLACK-MG, Monster 43” Flip-Down Safeties (Pair). Color, Size and Finish Material to be selected from manufacturer’s complete range by Architect. Complete assembly is required in Room 129, the Exercise Room.

d. Stepr Pro: Model # STR0004, StepR Pro. Color and Finish Material to be selected from manufacturer’s complete range by Architect. One (1) complete assembly is required in Room 129, the Exercise Room.

e. Concept 2 SkiErg: Model # C2-PN2715-US, Concept 2 Wall Mounted SkiErg with PM5. Factory Finish. One (1) complete assembly is required in Room 129, the Exercise Room.

f. Concept 2 SkiErg: Model # C2-PN2720-US, Concept 2 SkiErg Floor Stand v2. Factory Finish. One (1) complete assembly is required in Room 129, the Exercise Room.

g. Curl Bar Cable Attachment: Model # RA3255-BE, Rogue Curl Bar Cable Attachment. Color and Finish

h. Monster Landmine 2.0: Model #RA1671-IL, Rogue Monster Landmine 2.0. Factory Finish. Two (2) assemblies required in Room 129, the Exercise Room.

i. Single Landmine Handle: Model #RA1187, Rogue Single Landmine Handle, Factory Finish. Two (2) assemblies required in Room 129, the Exercise Room.

j. Butcher V2: Model #RA0542, Rogue Butcher V2 Plastic Ski Set. Factory Finish. One (1) complete assembly is required in Room 129, the Exercise Room.

M. Dining Table: Krueger Internation Inc, www.KI.com. Connecting Zone Collection; Rectilinear Conference Table. Size, Color, and Finish Material to be selected from manufacturer’s complete range by Architect. One (1) required in Room 118.

N. Dining Chairs: Krueger Internation Inc, www.KI.com. Altus Collection; Altus Fabric Task Chair – 24/7. Adjustable arms. Swivel-tilt with tilt lock mechanism. Size, Color, and Finish Material to be selected from manufacturer’s complete range by Architect. Eight (8) required in Room 118.

O. Conference Table: Krueger Internation Inc, www.KI.com. Serenade Collection, Rectangular Conference Table. Size, Color, and Finish Material to be selected from manufacturer’s complete range by Architect. One (1) required in Room 135.

P. Conference Chair: Krueger Internation Inc, www.KI.com. Altus Mesh Conference Chair with a 400-pound weight rating. The manufacturer must have at minimum a 15-year warranty. Size, Color, and Finish Material to be selected from manufacturer's complete range by Architect. Twelve (12) required in Room 135.

Q. Office Chair 1: Krueger Internation Inc, www.KI.com. Signia Task Chair. Color. Size, Color, and Finish Material to be selected from manufacturer's complete range by Architect. Verify quantity with Architect. Location as indicated on drawings.

R. Office Chair 2: Krueger Internation Inc, www.KI.com. LimeLite Conference Chair. Size, Color, and Finish Material to be selected from manufacturer's complete range by Architect. Verify quantity with Architect. Location as indicated on drawings.

S. Recliner: La-Z-Boy, www.la-z-boy.com. Model Redwood Wall Recliner 016776, Extra Tall Scale, with Standard Handle and Standard Cushion. Adjustable leg rest with side mounted handle and 3-position locking. provide leather cover. Color to be selected from manufacturer's complete range by Architect. Eight (8) are required in Room 117 Dayroom.

T. Glass Board: Claridge Glass, www.claridgeproducts.com. Model #GB3X4MGMI, Wall-Mounted Markerboard, with Invisi-mount mounting style option and magnetic option. Size as indicated in drawings. Verify quantity with Architect. Location as indicated on drawings.

U. Television Brackets: Peerless Industries, Inc., www.peerless-av.com. Provide the following:

1. Model SP850-UNLP wall mounted. Provide one (1) for each room. Rooms 104, 105, 107, 108, 110, 111, 113, 118, 119, 121, 129.

2. Model SA771PU wall mounted. Provide one (1) for each room. Rooms 117 and 135.

V. 85" TV: Samsung, www.samsung.com. Model# QN85QN90DAFXZA, 85" Class Neo QLED 4K QN90D. Provide one (1) for each room. Rooms 117 and 135.

W. 32" TV: Samsung, www.samsung.com. Model #QN55QN90DAFXZA, 55" Class Neo QLED 4K QN90D. Provide one (1) for each room. Rooms 105, 107, 108, 110, 111, 113, 119, 121.

X. 55" TV: Samsung, www.samsung.com. Model # QN32Q60DAFXZA, 55" Class Samsung Neo QLED 4K QN90C. Provide one (1) for each room. Rooms 104, 118, 129.

Y. Outdoor Table: Bright Idea Shops, www.brightideashops.com. Model #FP1011, Classic 6-Foot Picnic Table. Color to be selected from manufacturer's complete range by Architect. One (1) complete assembly required at Outdoor Patio.

Z. Barbeque: LYNX, www.lynxgrills.com. Model #L36ATRF, 36" Professional Grill Freestanding with all Trident Infrared Burners and Rotisserie. Color and Finish to be selected from manufacturer's complete range by Architect. One (1) complete assembly required at Outdoor Patio.

AA. Range and Accessories: Thor Kitchen, www.thorkitchen.com Model #LRG60E / LRG60ELP, 60 Inch Professional Gas Range, six burners with cast iron grill and cast-iron griddle, stainless steel finish. Accessories: Griddle cover, cutting board, and black knobs, 10" high stainless steel backguard. One (1) required at Room 116.

BB. Range Hood and Accessories: Thor Kitchen, www.thorkitchen.com. Model #XLH60, 60 Inch linear Hood, stainless steel finish, 10" rigid duct. One (1) required at Room 116.

CC. Ceiling Fan: Big Ass Fans, www.bigassfans.com. Aireye Collection, 24" Oscillating Ceiling Mount Fan, Color to be selected from manufacturer's complete range by Architect. Two (2) complete assemblies required in Room 129.

DD. Hose Tower: Tiger Hose Towers, www.tigerhosetower.com. Color to be selected from manufacturer's complete range by Architect. Verify size with architect. One (1) required location as indicated in drawing.

EE. Bike Rack:

1. Outdoor: Dero, www.dero.com. Model # RR2H-C - FT - EPX, Rolling Rack. Color and Factory Finish to be selected from manufacturer's complete range by Architect. Location as indicated on drawings.

2. Indoor: Dero, www.dero.com, Model Ultra Space Saver Single. Color and Factory Finish to be selected from manufacturer's complete Range by Architect. Four (4) required in Room 131.

FF. Solatube: Solatube, www.solatube.com. Model #750 DS-C Solamaster, Solatube 750DS-C Closed Ceiling, 21 in. daylighting system. Color to be selected from manufacturer's complete range by Architect. Verify size with Architect. Three (3) required, location as indicated in drawings.

GG. Phone Line Powered: Viking Electronics, www.vikingelectronics.com/. Model #E-1600-RDA-EWP, Compact emergency phone with enhanced weather protection. Color to be selected from manufacturer's complete range by Architect. Verify quantity with Architect. Verify location with Architect.

HH. VoIP Emergency Phone: Viking Electronics, www.vikingelectronics.com/. Model #E-1600-RD-IPEWP, Compact Emergency Phones, with enhanced weather protection. Color to be selected from manufacturer's complete range by Architect. Verify quantity with Architect. Verify location with Architect.

II. Knox Key Switch and Key Box: Knox Company, www.knoxbox.com. At automatic gates provide key opened switches, Series 3501 with dust cover. Coordinate installation as shown in the drawings.

JJ. Temporary Site Structures

1. Apparatus Bay: ShelterLogic, www.shelterlogic.com. Model Sheltertech SP Series Shelter. 26'-0" x 40'-0" x 19'-0", Round roof with Ultra Duty PVC 21.0 oz and 15-Year Warranty, door opening to be 14'-0" high minimum. Color to be Gray. Install per the manufacturer's recommendation. One (1) complete assembly required, location as indicated on the drawings.

2. Conex Storage: Southwest Mobile Storage, www.swmobilestorage.com. 8'-0" x 20'-0". Double door opening at both ends. Color to be selected by manufacturer's complete range. Install per the manufacturer's recommendation. One (1) complete assembly required, location as indicated on the drawings.

KK. Removable/Bollard Cover: Ideal Shield, www.idealshield.com, Model Flat Top, 1/8" thk Thermoplastic Polythylene with Ultra-Violet and Anti-Static additives, red reflective tape, color red (Pantone 187C). Provide as indicated on drawings.

LL. Shower Doors and Panels: American Shower, www.americanshowerdoor.com, Crystal Model with 1/2 inch obscured tempered ultra clear glass, wall mounted self centering hinges and through glass handle. Hardware Finish: Solid brass with chrome plated finish. Height: 6'-8". Width: Verify width required for final opening width. Three (3) assemblies required at various sizes, one (1) required in Rooms 106, 109, 120.

MM. Mattress: Tempur-Pedic, www.tempurpedic.com, TEMPUR-Adapt Collection, Model Advanced Pressure Relief (ProAdapt), Twin Long, Firm. Eight (8) assemblies required, one (1) required in Rooms 105, 107, 108, 110, 111, 113, 119, 121.

NN. Computers

1. Desktop Computers: DELL Technologies, www.dell.com, Model Dell Pro Slim Plus (210-BPPM). Two (2) assemblies required in Room 125.

2. Monitors: DELL Technologies, www.dell.com. Model 24" Monitor 5yr PS AE (210-BKRR). Per City PC deployment standard. Four (4) assemblies required in Room 125.

3. Soundbars: DELL Technologies, www.dell.com. Model Dell Monitor Slim Soundbar - SB521A (520AARU). Per City PC deployment Standard. Two (2) complete assemblies required in Room 125.

4. Battery Backups: DELL Technologies, www.dell.com. Model APC Back-UPS 850VA, 120V, 2 USB charging ports, 9 NEMA outlets (3 surge). Per City PC deployment Standard. Two (2) complete assemblies required in Room 125.

5. Web Cameras: Logitech, www.logitech.com. Model Logitech HD Pro Webcam C9205-webcam. Per City PC deployment Standard. Two (2) complete assemblies required in Room 125.

6. Printers: CDW-G, www.cdwg.com. Model HP Color LaserJet Pro MFP 4301fdn Printer Mfg. Part#: 4RA81F#BGJ. One (1) complete assembly required in Room 125.

7. Micro PC: DELL Technologies, www.dell.com. Model Dell Micro PC (210-BPPW). Per City PC deployment Standard. One (1) complete assembly required in Room 135.

8. Network Cabinet and Relation Infrastructure

    a. Equipment Rack: Panduit, www.panduit.com. Model 2-Post Standard Equipment Rack (R2P6S). One (1) complete assembly required in Room 133. Verify location with the City.

    b. Modular Patch Panel: Panduit, www.panduit.com. Model Panduit NKPP24FMY. One (1) complete assembly required in Room 133. Verify location with the City.

    c. Modular Jacks White: Panduit, www.panduit.com. Model Panduit NK6X88MWH. One (1) complete assembly required in Room 133. Verify location with the City.

    d. Cat 6A Plenum Cable: Prysmian, www.prysmian.com. Model Prysmian 7151820. One (1) complete assembly required in Room 133. Verify location with the City.

OO. Substitutions: Under provisions of Section 01 25 13.

3. PART 3 EXECUTION

3.1 INSTALLATION

A. Install equipment in accordance with manufacturer's printed instructions and as indicated on the drawings.

B. Furnish all necessary hardware, anchors, inserts, connections, and embedded items necessary for proper installation. Coordinate with work of other sections.

END OF SECTION

SECTION 12 24 13

ROLLER SHADES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fabric roller shades.

B. Room darkening shades.

C. Manual operation.

D. Accessories and attachment hardware.

1.2 REFERENCES

A. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. CEC – California Electrical Code.

C. NFPA 701 - Fire Tests for Flame-Resistant Textiles and Films.

D. UL325 – Listed Solution covering all controls, electrical accessories and motors.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Provide manufacturer's data sheets on each product used.

C. Shop Drawings: Provide plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.

D. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.

E. Samples: Provide 4 sets of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.

F. Maintenance Data: Provide methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company with a minimum of ten years experience and a minimum of five projects of similar scope and size to those specified in this section.

B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of five years experience in installing products comparable to those specified in this section.

1.5 REGULATORY REQUIREMENTS

A. Fire-Test-Response Characteristics: Shall pass NFPA 701, small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.

B. Electrical Components: CEC listed and labeled by UL and tested as a system. Individual testing of components will not be acceptable in lieu of system testing.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Anti-Microbial Characteristics: ASTM G 21, 'No Growth' results for fungi ATCC9642, ATCC 9644, ATCC9645.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products to site under provisions of Section 01 61 00.

B. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Verify dimensions by field measurements before fabrication.

1.9 WARRANTY

A. Provide warranties under provisions of Section 01 77 00.

B. Roller Shade Hardware and Standard Shadecloth: Manufacturer's non-depreciating twenty-five-year limited warranty.

C. Roller Shade Installation: One year from date of Substantial Completion.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of -Design Product: Subject to compliance with requirement, provide products manufactured by Mecho, www.mecho.shade.com.

B. Comparable products manufactured by one of the following manufacturers are acceptable:

1. Draper Inc., www.draperinc.com.

2. Hunter Douglas/Nysan Shading Systems Ltd., www.hunterdouglascontract.com.

3. Lutron Electronics Co., Inc. www.lutron.com.

4. Skyco Shading Systems, Inc., www.skycoshade.com.

5. Spring Window Fashions, www.swfcontract.com.

C. Substitutions: Under provisions of Section 01 25 13.

2.2 APPLICATION

A. Roller Shade Schedule:

1. Shade Type 1: Manual operating, chain drive, sunscreen roller shades in exterior windows of rooms and spaces indicated on the Drawings.

2. Shade Type 2: Manual operating, chain drive, room darkening blackout roller shades in exterior windows of rooms and spaces indicated on the Drawings.

2.3 OPERATION

A. Manual Operated Shades:

1. Universal, regular and offset drive capacity. Allow drive chain to fall at front, rear or non-offset for drive end brackets.

2. Hardware to be minimum of 1/8 inch thick plated steel capable of supporting 150 percent of weight of each shade.

3. Installation to be designed for a removable fascia for both regular and reverse roll. Fascia to be installed with no exposed fasteners.

4. Fascia to be mounted continuously across two or more shade bands.

5. System to allow operation of multiple shade bands by single chain operator.

6. Shade roller tube to have positive mechanical engagement for drive mechanism.

7. Drive Bracket / Brake Assembly: Mecho Model M/5.

8. Drive Chain: No. 10 stainless steel chain rated at a minimum of 90 lb. breaking strength.

2.4 SHADE CLOTH

A. Visually Transparent Single-Fabric Shadecloth: MechoShade Systems, Inc.

1. Dense Basket Weave: "SOHO 1900 Series," 5 percent open.

2. Color: Selected from manufacturer's standard colors.

B. Woven Room Darkening Shadecloth with Opaque Acrylic Backing (PVC Free): Mecho, "Chelsea Blackout 0250 Series" comprised of 50 percent acrylic coating, 50 percent polyester.

2.5 SHADE BAND

A. Shade Bands: Includes fabric, enclosed hem weight, shade roller tube, and attachment of shade band to roller tube. Sewn hems and open hem pockets are not acceptable.

1. Concealed Hembar: Continuous extruded aluminum for entire width of shade band heat sealed on all sides.

2. Shade Band and Shade Roller Attachment:

(a) Extruded aluminum shade roller tube of diameter and wall thickness required to support shade fabric without deflection.

(b) Positive mechanical attachment of shade band to roller tube; shade band to be removable / replaceable with a "snap-on" "snap-off" spline mounting, without having to remove shade roller from shade brackets.

(c) Mounting spline shall not require use of adhesives, adhesive tapes, staples, or rivets.

2.6 SHADE FABRICATION

A. Shadecloth to hang flat without buckling or distortion.

B. Heat-sealed trimmed edges to hang straight without curling or raveling.

C. Unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch in either direction per 8 feet of shade height due to warp distortion or weave design.

D. Fabricate hem as follows:

1. Concealed hemtube.

2. Exposed blackout hembar with light seal.

E. Provide battens in standard shades to assure proper tracking and uniform rolling of the shadebands. Battens shall be roll-formed stainless steel or tempered steel.

F. Battens shall be concealed in an integrally-colored fabric to match the inside and outside colors of the shadeband.

G. Provide battens for railroaded shades when width-to-height ratios meet or exceed manufacturer's standards.

H. Blackout shadebands, when used in side channels, shall have horizontally mounted, roll-formed stainless steel or tempered-steel battens not more than 3 feet on center extending fully into the side channels.

2.7 COMPONENTS

A. Access and Material Requirements:

1. Provide shade hardware that allows the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.

2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.

3. Use only Delran engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester shall not be used.

2.8 ACCESSORIES

A. Roller Shade Pocket: Aluminum recessed shade pocket mounted as indicated on the drawings.

B. Fascia.

1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets with no exposed fasteners.

2. Install across two or more shade bands in one piece.

3. Fully conceal brackets, shade roller and fabric on the tube.

4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.

5. Do not notch fascia for manual chain.

C. Room Darkening Side and Sill Channels:

1. Extruded aluminum with polybond edge seals and SnapLoc-mounting brackets with concealed fastening.

2. Channels shall accept one-piece exposed blackout hembar with vinyl seal to assure side light control and sill light control.

3. Side channels 2-5/8 inches may be used as center supports for manually operated room darkening shades over 8 feet in height.

4. Color: Selected from all manufacturer's colors by Architect.

D. Manual Side and Sill Channels:

1. Manual shade side channels, 1-15/16 inches wide by 1-3/16 inches deep, two-band center channels, 2-5/8 inches wide by 1-3/16 inches deep. 2-5/8-inch double-center channels at center-support positions.

2. For shade bands over 8 feet, provide 2-1/2 wide by 1-3/16 inches deep side channels.

3. Color: Selected from manufacturer's custom colors by Architect.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify field measurements are as shown on shop drawings.

C. Notify Architect of unsatisfactory preparation before proceeding.

D. Beginning of installation means installer accepts existing conditions.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces as recommended by the manufacturer.

3.3 INSTALLATION

A. Install roller shades in accordance with manufacturer's instructions and in compliance with Section 01 73 00.

B. Install roller shades level, plumb, square, and true.

C. Locate shade band no closer than 2 inches to interior face of glass.

D. Allow proper clearances for window operation hardware.

3.4 ADJUSTING

3.1 Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.2 LEANING

A. Clean roller shade surfaces after installation according to manufacturer's written instructions.

3.3 DEMONSTRATION

A. Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 48 15

EXTERIOR ENTRANCE FLOOR MATS AND FRAMES

1. PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Entrance floor mats to be installed on exterior walkways at locations and sizes as indicated on drawings.

B. Related Requirements:

Division 01 - General Requirements.

1. Section 03 30 00 - Cast-in-Place Concrete.

1.02 REFERENCES

A. ASTM International (ASTM):

1. ASTM D2047 - Static Coefficient of Friction.

2. ASTM B 221-93 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes .

1.03 SUBMITTALS

A. Product Data: Submit manufacturer’s published technical data describing materials, construction and recommended installation procedures.

B. Maintenance Instructions: Submit manufacturer’s recommendations for maintenance, care and cleaning.

C. Samples: Submit Samples of entrance mat in each available color and pattern. Following color selections, submit full size Samples of each selected color and pattern.

D. Maintenance Materials: Before Substantial Completion, deliver one unopened container of each color and pattern of entrance floor mat in each color and pattern installed. Label each container indicating locations installed. Include unopened cans of adhesives adequate to install the maintenance materials.

E. Installer’s Experience Qualifications: Submit list of not less than five projects, extending over period of not less than five years, indicating installer’s experience record. Submit letter from manufacturer indicating manufacturer's approval for installer of the products.

1.04 QUALITY ASSURANCE

A. Qualifications of Installer: Minimum five years experience in successfully installing the same or similar flooring materials.

1.05 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to Project site in original unopened manufacturer's packaging clearly labeled with manufacturer's name. Materials shall be stored at not less than 70 degrees F for not less than 48 hours before installation.

1.06 PROJECT CONDITIONS

A. Close spaces to traffic during entrance floor mat installation.

B. Install entrance floor mats after other finishing operations, including painting, have been completed.

1.07 WARRANTY

A. Provide a five year warranty for material, fabrication, and installation.

2. PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Nystrom, Gratedesign Entrance Mats and Grilles.

2.02 MATERIALS

A. Entrance Mat: Nystrom GRATEdesign Rigid Grille, GD74.

a. Tread inserts: Single treads, ribbed rubber, GD74U.

1. Vinyl mat: Injection molded PVC

2. System structural performance: Wheel load of 1200 lb per wheel.

3. Frames:

a. Aluminum Frame: Extruded 6063-T5 clear aluminum alloy.

b. Construction: Frames shall be shipped in 72-inch sections.

c. Mounting:

1) Level Bed Channel frame (LCH): Aluminum mechanically attached, FD74LBM.

B. Comply with the following requirements as a minimum:

1. ASTM D2047 - Static Coefficient of Friction: Shall exceed ADA recommended rating of .60.

2. ASTM B221-93 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.

3. PART 3 EXECUTION

3.01 COORDINATION

A. Coordinate with related Work to assure level, smooth and clean finish surfaces to receive entrance floor mat.

3.02 EXAMINATION

A. Field verify dimensions and other conditions affecting the Work of this section.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of entrance floor mat.

C. Before Work is commenced, examine surfaces that are to receive entrance floor mat, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Deficiencies shall be corrected before starting Work of this section.

3.03 CONCRETE SLAB PREPARATION

A. Do not start preparation until concrete floor slabs are at least 90 days old.

B. Leveling: Check sub-floors for true to level and plane within a tolerance of 1/8 inch in 10-feet. Test floor areas both ways with a 10-foot straightedge and repair high and low areas exceeding allowable tolerance. Pop ups shall be hammered out and floor filled with a cementitious leveling compound. Remove high areas by power sanding, stone rubbing or grinding, chipping off and filling with leveling compound, or equivalent method. Fill low areas with leveling compound. Repair and level the surfaces having

C. abrupt changes in plane, such as trowel marks or ridges, whether or not within the allowable tolerance. Clean areas where repairs are performed.

D. Cleaning: After leveling, clean substrates of deleterious substances and foreign matter. Fill cracks or depressions with cementitious leveling compound of the type recommended by flooring manufacturer for the specific Work conditions.

E. Priming: Prime concrete floor slabs on grade; prime other slabs as recommended by entrance mat manufacturer.

3.04 INSTALLATION OF MAT

A. Comply with manufacturer's written instructions for installing entrance floor mat.

B. Mechanically cut flooring material to provide square true edges.

C. Scribe, cut, and fit entrance floor mat and edging to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames. Extend floor mat into toe spaces, door reveals and similar openings.

D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on entrance floor mat as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

3.05 CLEANING AND COMPLETION

A. Maintain entrance mat surfaces clean as installation progresses. Clean entrance mat when sufficiently seated and removed foreign substances. Clean adjacent surfaces of debris and other defacement.

B. Remove rubbish, debris and waste material and legally dispose of off the Project site.

3.06 PROTECTION

A. Protect and cover entrance floor mats until Substantial Completion.

3.07 INSTRUCTION

A. After Work of this section is complete, entrance mat manufacture's technical representative shall provide instruction to OWNER flooring maintenance staff.

END OF SECTION

SECTION 12 48 43

FLOOR MATS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Walk off carpet roll mat.

B. Tapered transition molding.

1.2 SUBMITTALS

A. Submit product data and samples under provisions of Section 01 33 00.

B. Product Data: Include manufacturer's specifications and installation instructions, construction details, material descriptions, dimensions of individual components and profiles, and finishes for floor mat and transition strip.

C. Samples: Provide two, 6-inch square sections of floor mat, and two, 6-inch long sections of tapered transition molding showing each color available.

1.3 REGULATORY REQUIREMENTS

A. Accessibility: Comply with accessibility requirements of the CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, and the 2010 Americans with Disabilities Act (ADA), Standards for Accessible Design.

1.4 COORDINATION

A. Coordinate size and location of areas to receive floor mats.

1.5 OPERATION AND MAINTENANCE DATA

A. A. Submit maintenance data under provisions of Section 01 77 00.

B. B. Maintenance Data: Provide data for cleaning and maintaining floor mats.

1.6 EXTRA MATERIALS

A. Submit maintenance materials under the provisions of Section 01 77 00.

B. Provide 50 square feet of floor matting and 20 lineal feet of transition molding.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Nystrom, www.nystrom.com.

B. Substitutions: Under provisions of Section 01 25 13.

2.2 FLOOR MATS

A. Walk- Off Carpet Roll Mat:

1. Nystrom, Collection; MAXtread Entrance Mats & Grilles, MX12-NF, www.nystrom.com. Color as selected by Architect from manufacturer's entire selection.

2. Substitutions: Under provisions of Section 01 25 13.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions, for compliance with requirements for location, sizes, and other conditions affecting installation of floor mats.

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

3.2 INSTALLATION

A. A. Defer installation of floor mats until project is near Substantial Completion.

B. Install units to comply with manufacturer's written instructions at locations indicated.

3.3 PROTECTION

A. Provide temporary cover of plywood or fiberboard as protective flooring over floor mats.

B. Maintain protection until construction traffic has ended and project is near Substantial Completion.

END OF SECTION

SECTION 21 05 17

SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION PIPING

1. 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. Sleeves.

2. Grout.

1.3 ACTION SUBMITTALS

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

2. PART 2 PRODUCTS

2.1 SLEEVES

A. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

B. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

2.2 SLEEVE-SEAL SYSTEMS

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

1. Metraflex Company (The).
2. Pipeline Seal and Insulator, Inc.
3. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

2. Pressure Plates: Carbon steel.

C. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

3. PART 3 EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves

b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.

2. Exterior Concrete Walls below Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6 : Galvanized-steel-pipe sleeves.

b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.

END OF SECTION

SECTION 21 05 53

IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.

2. Warning signs and labels.

3. Pipe labels.

4. Stencils.

5. Valve tags.

6. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.

D. Valve Schedules: Valve numbering scheme.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each piping system to include in maintenance manuals.

2. PART 2 PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032 inch thick, with predrilled holes for attachment hardware.

2. Letter Color: Black.

3. Background Color: Red.

4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

6. Fasteners: Stainless-steel rivets.

7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment-Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; pipe size; and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

2. Lettering Size: At least 1-1/2 inches high.

E. Pipe-Label Colors:

1. Background Color: Red.

2. Letter Color: White.

2.3 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping-system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032 inch thick, with predrilled holes for attachment hardware.

2. Fasteners: Brass wire-link chain.

3. Valve-Tag Color: Red.

4. Letter Color: White.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

3. PART 3 EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 LABEL INSTALLATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install or permanently fasten labels on each major item of mechanical equipment.

D. Locate equipment labels where accessible and visible.

E. Piping Color-Coding: Painting of piping is specified in Section 099123 "Interior Painting."

1. Identification Paint: Use for contrasting background.

2. Stencil Paint: Use for pipe marking.

F. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.

2. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

3.3 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems. List tagged valves in a valve-tag schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below:

1. Valve-Tag Size and Shape:

a. Fire-Suppression Standpipe: 1-1/2 inches, round.

b. Wet-Pipe Sprinkler System: 1-1/2 inches, round.

3.4 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

SECTION 21 13 13

WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.

2. Fire-protection valves.

3. Sprinklers.

4. Alarm devices.

5. Pressure gages.

B. Related Sections:

1. Section 211200 "Fire-Suppression Standpipes" for standpipe piping.

1.3 DEFINITIONS

A. High-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure higher than standard 175 psig, but not higher than 250 psig.

B. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175 psig maximum.

1.4 SYSTEM DESCRIPTIONS

A. The Contractor shall be responsible for the Automatic Fire Sprinkler inside of the building within five feet (5') of the foundation, and within the building itself. See Civil Engineer's plans for onsite Fire system. This specification is intended to establish the required performance and quality of the work necessary to provide for a complete automatic sprinkler system above and below ceiling to serve the buildings on site as indicated on the drawings. (There shall not be any expose fire sprinkler piping below ceiling inside apparatus bay or outside building.)

1.5 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

B. Sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.

2. Sprinkler Occupancy Hazard Classifications:

a. Building Service Areas: Ordinary Hazard, Group 1.

b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.

c. General Storage Areas: Ordinary Hazard, Group 1.

d. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.

e. Office and Public Areas: Light Hazard.

3. Minimum Density for Automatic-Sprinkler Piping Design:

a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.

b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.

4. Maximum Protection Area per Sprinkler: Per UL listing.

5. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:

a. Light-Hazard Occupancies: 100 gpm for 30 minutes.

b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.

C. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

E. Fire-hydrant flow test report.

F. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. 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.

D. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13, "Installation of Sprinkler Systems."

1.8 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

A. Standard Weight, Galvanized- and Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Schedule 30, Galvanized- and Black-Steel Pipe: ASTM A 135; ASTM A 795/A 795M, Type E; or ASME B36.10M, wrought steel; with wall thickness not less than Schedule 30 and not more than Schedule 40. Pipe ends may be factory or field formed to match joining method.

C. Nonstandard OD, Thinwall Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, thinwall, with plain ends and wall thickness less than Schedule 10.

D. Galvanized- and Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

E. Galvanized and Uncoated, Steel Couplings: ASTM A 865, threaded.

F. Galvanized and Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

G. Malleable- or Ductile-Iron Unions: UL 860.

H. Cast-Iron Flanges: ASME 16.1, Class 125.

I. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

J. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

K. Grooved-Joint, Steel-Pipe Appurtenances:

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

a. Anvil International, Inc.

b. Tyco Fire & Building Products LP.

c. Victaulic Company.

2. Pressure Rating: 175 psig minimum.

3. Galvanized and Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.

4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

L. Steel Pressure-Seal Fittings: UL 213, FM-approved, 175-psig pressure rating with steel housing, rubber O-rings, and pipe stop; for use with fitting manufacturers' pressure-seal tools.

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

a. Victaulic Company.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free.

1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.

2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. Valves shall be UL listed or FM approved.

2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig.

3. Minimum Pressure Rating for High-Pressure Piping: 250 psig.

B. Ball Valves:

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

a. Anvil International, Inc.

b. Victaulic Company.

2. Standard: UL 1091 except with ball instead of disc.

3. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.

4. Valves NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.

5. Valves NPS 3: Ductile-iron body with grooved ends.

C. Check Valves:

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

a. Anvil International, Inc.

b. NIBCO INC.

c. Tyco Fire & Building Products LP.

d. Victaulic Company.

2. Standard: UL 312.

3. Pressure Rating: 250 psig minimum.

4. Type: Swing check.

5. Body Material: Cast iron.

6. End Connections: Flanged or grooved.

D. Indicating-Type Butterfly Valves:

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

a. Anvil International, Inc.

b. Tyco Fire & Building Products LP.

c. Victaulic Company.

2. Standard: UL 1091.

3. Pressure Rating: 175 psig minimum.

4. Valves NPS 2 and Smaller:

a. Valve Type: Ball or butterfly.

b. Body Material: Bronze.

c. End Connections: Threaded.

5. Valves NPS 2-1/2 and Larger:

a. Valve Type: Butterfly.

b. Body Material: Cast or ductile iron.

c. End Connections: Flanged, grooved, or wafer.

6. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch visual indicating device.

2.5 TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

2. Pressure Rating: 175 psig minimum.

B. Angle Valves:

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

a. Fire Protection Products, Inc.

b. United Brass Works, Inc.

C. Ball Valves:

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

a. Anvil International, Inc.

b. Tyco Fire & Building Products LP.

c. Victaulic Company.

D. Globe Valves:

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

a. Fire Protection Products, Inc.

b. United Brass Works, Inc.

E. Plug Valves:

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

a. Southern Manufacturing Group.

2.6 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

2. Pressure Rating:

a. Standard-Pressure Piping Specialty Valves: 175 psig minimum.

b. High-Pressure Piping Specialty Valves: 250 psig minimum.

3. Body Material: Cast or ductile iron.

4. Size: Same as connected piping.

5. End Connections: Flanged or grooved.

B. Alarm Valves:

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

a. Reliable Automatic Sprinkler Co., Inc.

b. Tyco Fire & Building Products LP.

c. Victaulic Company.

2. Standard: UL 193.

3. Design: For horizontal or vertical installation.

4. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages and fill-line attachment with strainer.

2.7 SPRINKLER SPECIALTY PIPE FITTINGS

A. Flow Detection and Test Assemblies:

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

a. Reliable Automatic Sprinkler Co., Inc.

b. Tyco Fire & Building Products LP.

c. Victaulic Company.

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

3. Pressure Rating: 175 psig minimum.

4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.

5. Size: Same as connected piping.

6. Inlet and Outlet: Threaded.

B. Sprinkler Inspector's Test Fittings:

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

a. Tyco Fire & Building Products LP.

b. Victaulic Company.

c. Viking Corporation.

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

3. Pressure Rating: 175 psig minimum.

4. Body Material: Cast- or ductile-iron housing with sight glass.

5. Size: Same as connected piping.

6. Inlet and Outlet: Threaded.

2.8 SPRINKLERS

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

1. Reliable Automatic Sprinkler Co., Inc.

2. Tyco Fire & Building Products LP.

3. Victaulic Company.

B. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.

C. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.

2. Nonresidential Applications: UL 199.

3. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

D. Sprinkler Finishes:

1. Color and finish of all corrosion-resistant sprinklers shall be as approved by Architect.

E. Water-Flow Indicators:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Potter Electric Signal Company.

2. Standard: UL 346.

3. Water-Flow Detector: Electrically supervised.

4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.

5. Type: Paddle operated.

6. Pressure Rating: 250 psig.

7. Design Installation: Horizontal or vertical.

F. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Potter Electric Signal Company.

2. Standard: UL 346.

3. Type: Electrically supervised.

4. Components: Single-pole, double-throw switch with normally closed contacts.

5. Design: Signals that controlled valve is in other than fully open position.

2.9 Sprinkler Heads:

A. Interior Finished Ceilings and Exterior Soffits:

1. Heads shall be Reliable Model F4FR quick response, concealed, flush-to-ceiling automatic sprinklers. Equivalent products of Viking or Tyco are acceptable. Corrosion-resistant finish shall be installed at exterior areas; finish shall be polyester or Teflon coating with matching escutcheon. Cover plate finish shall be per Architect's specifications. Color shall be factory finish in custom color as selected by the Architect. Up to four (4) different colors will be selected for use in varying amounts at all sprinkler head locations.

2. All areas without Suspended Ceilings, Concealed Areas, Unfinished Ceilings and Storage Areas: Heads shall be Reliable, model F1FR quick response sprinkler upright/pendent with rough brass finish. Equivalent products of Viking or Tyco are acceptable. Where required, escutcheons shall be Sweet and Donaldson #401 with chrome finish at storage, mechanical, and electrical room ceilings.

3. Concealed Areas: Heads shall be Reliable, model F1FR quick response sprinkler upright/pendent with rough brass finish. Equivalent products of Viking or Tyco are acceptable. Where required, escutcheons shall be Sweet and Donaldson #401 with chrome finish at storage, mechanical, and electrical room ceilings.

4. Sidewall Sprinklers: Sidewall sprinklers Reliable Model F1FR quick response sprinkler, and may be installed for interior and exterior applications, subject to prior approval by Architect. Heads shall be Reliable Model F1FR quick response sprinkler horizontal, with bright chrome finish. Equivalent products of Viking or Tyco are acceptable.

5. Temperature Ratings: Heads below finished ceilings, and in all other occupied areas shall have a temperature rating of Ordinary (155-165 degrees). Heads in unventilated, concealed and void spaces shall have a temperature rating of Intermediate (200-212 degrees), unless otherwise required by code.

6. Provide metal cabinet for a reserve supply of sprinkler heads, as required by N.F.P.A. 13. Include suitable head wrenches for each type of sprinkler installed. Stock shall include all types and temperature ratings installed. Locate as directed by Architect.

B. Special Coatings:

1. Wax.

2. Lead.

3. Corrosion-resistant paint.

C. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, two piece, with 1-inch vertical adjustment.

2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

D. Water-Flow Indicators:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Potter Electric Signal Company.

2. Standard: UL 346.

3. Water-Flow Detector: Electrically supervised.

4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.

5. Type: Paddle operated.

6. Pressure Rating: 250 psig.

7. Design Installation: Horizontal or vertical.

E. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Potter Electric Signal Company.

2. Standard: UL 346.

3. Type: Electrically supervised.

4. Components: Single-pole, double-throw switch with normally closed contacts.

5. Design: Signals that controlled valve is in other than fully open position.

2.10 PRESSURE GAGES

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

1. AMETEK; U.S. Gauge Division.

2. Ashcroft, Inc.

3. Brecco Corporation.

4. WIKA Instrument Corporation.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gage Range: 0 to 250 psig minimum.

E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.2 SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements for exterior piping in Section 211100 "Facility Fire-Suppression Water-Service Piping."

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping. Comply with requirements for backflow preventers in Section 211100 "Facility Fire-Suppression Water-Service Piping."

3.3 WATER-SUPPLY CONNECTIONS

A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Section 221116 "Domestic Water Piping."

B. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.4 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

C. Install seismic restraints on piping. Comply with requirements for seismic-restraint device materials and installation in NFPA 13.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install alarm devices in piping systems.

K. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

L. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

M. Fill sprinkler system piping with water.

N. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

O. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.5 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.

I. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

M. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

N. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.6 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.

2. Alarm Valves: Include bypass check valve and retarding chamber drain-line connection.

3.7 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.

3.8 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.

4. Energize circuits to electrical equipment and devices.

5. Coordinate with fire-alarm tests. Operate as required.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.10 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

3.11 DEMONSTRATION

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

3.12 PIPING SCHEDULE

A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast-iron threaded fittings; and threaded joints.

B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

C. Standard-pressure, wet-pipe sprinkler system, NPS 1 and smaller, shall be the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

D. Standard-pressure, wet-pipe sprinkler system, NPS 1-1/4 to NPS 4, shall be one of the following:

1. Standard-weight, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

2. Standard-weight, black-steel pipe with plain ends; steel welding fittings; and welded joints.

3. Thinwall Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

E. Standard-pressure, wet-pipe sprinkler system, NPS 5 and larger, shall be one of the following:

1. Standard-weight, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

2. Standard-weight, black-steel pipe with plain ends; steel welding fittings; and welded joints.

3. Thinwall Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

4. Thinwall Schedule 10, black-steel pipe with plain ends; welding fittings; and welded joints.

3.13 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Fire Station: Quick response concealed sprinklers.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Color and finish of all corrosion-resistant sprinklers shall be as approved by Architect.

END OF SECTION

SECTION 22 05 13

COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.

2. Torque, speed, and horsepower requirements of the load.

3. Ratings and characteristics of supply circuit and required control sequence.

4. Ambient and environmental conditions of installation location.

1.4 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.5 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.6 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.7 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.8 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.9 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.10 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.11 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

   a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

      1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

   b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.12 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.13 RECORD DRAWINGS

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.14 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40°C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.

2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F.

J. Code Letter Designation:

1. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.

2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.

3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.

4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.

2. Split phase.

3. Capacitor start, inductor run.

4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION

SECTION 22 05 17

SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

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. Sleeves.

2. Sleeve-seal systems.

3. Grout.

1.3 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.6 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.7 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.8 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.9 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.10 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.11 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.12 RECORD DRAWINGS

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.13 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 SLEEVES: Shall be plastic or galvanized steel where pipes pass through concrete walls or floor slabs.

A. Isolate pipes through ground floor slabs with Kraft paper, plastic tape or similar materials unless conduit is specified or indicated.

B. Sleeves for pipes through exterior walls shall be non-metallic with minimum 2” weep ring as manufactured by Link Seal. Pipe shall be sealed with Link Seal modular seal with EPDM seal elements.

C. Sleeves in or through fire rated walls shall be per U.L. Fire Resistance System No. WL1146 for drywall construction, and U.L. Fire Resistance System No. CAJ1044 for concrete construction. See architectural plans for all locations of rated walls.

D. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

E. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.2 SLEEVE-SEAL SYSTEMS

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

1. Advance Products & Systems, Inc.

2. Metraflex Company (The).

3. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

2. Pressure Plates: Stainless steel.

3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.

2. Cut sleeves to length for mounting flush with both surfaces.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.

2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.

3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls below Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

2. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

4. Interior Partitions:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

END OF SECTION

SECTION 22 05 18

ESCUTCHEONS FOR PLUMBING PIPING

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. Escutcheons.

2. Floor plates.

1.3 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.6 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.7 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.8 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.9 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.10 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.11 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.12 RECORD DRAWINGS

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.13 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated and rough-brass finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.

c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

d. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

e. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated or rough-brass finish.

f. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated or rough-brass finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.

2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 22 05 23

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Bronze ball valves.

2. Ductile-iron, single-flange butterfly valves.

3. Bronze lift check valves.

4. Bronze swing check valves.

5. Bronze gate valves.

6. Iron gate valves

7. Manual circuit balancing valves.

8. Gas shut-off cocks.

9. LPG shut-off cocks.

B. Related Sections:

1. Division 2 water distribution piping Sections for general-duty and specialty valves for site construction piping.

2. Division 15 plumbing piping Sections for specialty valves applicable to those Sections only.

3. Division 15 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene diene terpolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.4 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.5 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.6 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.7 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.8 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.9 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.10 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.11 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

   a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

   b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

   c. Include all pertinent construction, installation, performance and technical data.

   d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

      1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

      2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

   e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

   a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

      1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".

   b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.12 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

2. ASME B31.1 for power piping valves.

3. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61-G and NSF-372 for valve materials for potable-water service.

1. Valves for domestic water must comply with the Federal Reduction of Lead in Drinking Water Act.

a. “Lead Free” refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤ 0.25%.

b. All valves must be 3rd party certified.

c. Bronze valves shall be made of dezincification-resistant material.

1.13 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.

2. Protect threads, flange faces, grooves, and weld ends.

3. Set angle, gate, and globe valves closed to prevent rattling.

4. Set ball and plug valves open to minimize exposure of functional surfaces.

5. Set butterfly valves closed or slightly open.

6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

1.14 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.15 RECORD DRAWINGS

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.16 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Piping systems shall be supplied with valves arranged so as to give complete and regulating control of each building and piping systems throughout the building, and located so all parts are easily accessible and maintained.

1. Valve Design: Rising stem or outside screw and yoke stems. Non-rising stem valves may be used where space conditions prevent full extension of rising stems.

2. Sizes: Same size as upstream pipe, unless otherwise indicated.

3. Extended stems: Where piping insulation is indicated or specified, valves shall be equipped with 2" extended handles of non-thermal conductive material. Also provide a protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation. Supply with memory stops, which are fully adjustable after insulation is applied.

4. End Connection: 2 inch and under shall be threaded, 2-1/2 inches and larger shall be flanged or full lug style.

C. Valves for Potable Water must comply with California Lead Free Law, effective January 1, 2010.

1. "Lead Free" refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤ 0.25%. Source: California Health & Safety Code (116875).

2. All valves must be 3rd party certified.

3. Bronze valves shall be made with dezincification-resistant material.

D. Where possible, valves of one manufacturer shall be used.

E. Provide Class 150 valves meeting the valve specifications where Class 125 valves are specified but are not available.

F. Bronze valves shall be made with dezincification-resistant materials, (Bronze ASTM B62, B61, or B584 Alloy C87850). This includes body, ball, stem and / or trim.

G. Bronze Valves: NPS 2 and smaller with threaded ends, unless otherwise indicated.

H. Ferrous Valves: NPS 2-1/2 and larger with flanged ends, unless otherwise indicated.

I. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

J. Valve Sizes: Same as upstream piping unless otherwise indicated.

K. Valve Actuator Types:

1. Hand-wheel: For valves other than quarter-turn types.

2. Hand-lever: For quarter-turn valves NPS 6 and smaller.

L. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after insulation is applied.

a. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Nib-seal handle extension or comparable product by one of the following:

b. General valves:

1) NIBCO

2) Hammond

3) Milwaukee

c. Below grade domestic water shut-off valves (gate valves) 2” and larger:

1) NIBCO.

2) Clow.

3) Mueller.

d. Butterfly Valves:

1) NIBCO.

2) Demco.

3) Dezuric.

e. Plug Valves:

1) Hammond.

2) Milwaukee.

f. Check valves, lift type:

1) Hammond.

2) Milwaukee.

g. Below grade backwater valve isolation valves:

1) NIBCO.

2) Clow.

3) Mueller.

2. Butterfly Valves: With extended neck.

M. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves, ASME B16.5 for steel valves.

2. Grooved: With grooves according to AWWA C606.

3. Solder Joint: With sockets according to ASME B16.18.

4. Threaded: With threads according to ASME B1.20.1.

N. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

A. Three-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim & Nib-Seal Handle:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-595-Y-66-LF or T-595-Y-66-LF or a comparable product by one of the following,

a. Milwaukee Valve Company.

b. Apollo.

2. Description:

c. Standard: MSS SP-110, NSF 61-G.

d. CWP Rating: 600 psig.

e. Body Design: Three piece with threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing.

f. Body Material: Bronze ASTM B 584 Alloy C87850 or C87600.

g. Ends: Threaded or Solder.

h. Seats: PTFE or TFE.

i. Stem: 316 Stainless steel.

j. Ball: 316 Stainless steel, vented.

k. Port: Full.

B. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim & Nib-Seal Handle:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-585-66-LF or T-585-66-LF or a comparable product by one of the following:

a. Conbraco Industries, Inc.; Apollo Div.

b. Milwaukee Valve Company.

2. Description:

a. Standard: MSS SP-110, NSF 61-G.

b. CWP Rating: 600 psig.

c. Body Design: Two piece with threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing.

d. Body Material: Bronze ASTM B 584 Alloy C87600.

e. Ends: Threaded or Solder.

f. Seats: PTFE or TFE.

g. Stem: 316 Stainless steel.

h. Ball: 316 Stainless steel, vented.

i. Port: Full.

j. Retain one or more of eight paragraphs in this article if bronze ball valves are required. MSS SP-110 covers both brass and bronze, copper-alloy ball valves NPS 1/4 to NPS 4 (DN 8 to DN 100). See the Evaluations and manufacturers' catalogs before selecting either brass or bronze ball valves or including both.

k. Caution: Two-piece ball valves with a full or regular port are recommended for most services. One-piece ball valves have a reduced port and one fewer leak path. Three-piece ball valves are recommended if disassembly without removing valve from piping is required.

l. Where pressure drop is a concern, use full-port ball valves. For corrosive or high-temperature applications, use stainless-steel-trim ball valves.

C. 200 CWP, Sizes 2-1/2" – 24", Ductile Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model LD-2000-3/5, or a comparable product by one of the following:

a. Cooper Cameron Corp.; Cooper Cameron Valves Div.

b. Tyco International, Ltd.; Tyco Valves & Controls

2. Description:

a. Standard: MSS SP-67, Type I, IAPMO.

b. NPS 24 (DN 300) and Smaller CWP Rating: 200 psig (1380 kPa).

c. Body Design: Full Lug type; Bubble tight shutoff, suitable for bidirectional dead-end service at rated pressure without use of downstream flange.

d. Body Material: ASTM A 536, ductile iron.

e. Seat: EPDM.

f. Stem: One- or two-piece stainless steel.

g. Disc: Aluminum bronze

D. Retain one or more of six paragraphs in this article if iron, single-flange butterfly valves are required. MSS SP-67 covers iron, single-flange butterfly valves NPS 1-1/2 to NPS 72.

2.3 BRONZE LIFT CHECK VALVES

A. Class 125, Lift Check Valves with Nonmetallic TFE Disc:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-480-Y-LF or T-480-Y-LF or a comparable product by one of the following:

a. Hammond.

b. Milwaukee.

2. Description:

a. Standard: MSS SP-80, Type 2, NSF 61-G.

b. CWP Rating: 200 psig.

c. Body Design: Vertical flow.

d. Body Material: ASTM B 584 Alloy C87850, lead free bronze.

e. Ends: Threaded or Solder.

f. Disc: PTFE, or TFE.

2.4 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Nonmetallic TFE Disc:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-413-Y-LF or T-413-Y-LF or a comparable product by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Powell Valves.

2. Description:

a. Standard: MSS SP-80, Type 4, NSF 61-G.

b. CWP Rating: 200 psig.

c. Body Design: Y-pattern Horizontal flow.

d. Body Material: ASTM B 584 Alloy C87850, lead free bronze.

e. Ends: Threaded or Solder.

f. Disc: PTFE or TFE.

2.5 BRONZE GATE VALVES

A. NRS Bronze Gate Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-113-LF or T-113-LF or a comparable product by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Powell Valves.

2. Description:

a. Standard: MSS SP-139, Type 2, NSF 61-G.

b. CWP Rating: 200 psig.

c. Body Material: ASTM B 584, dezincification-resistant bronze with integral seat and threaded bonnet.

d. Ends: Threaded or Solder.

e. Stem: Lead free Silicon Bronze.

f. Disc: Solid wedge; lead free bronze.

g. Packing: Asbestos free.

h. Handwheel: Malleable iron.

B. RS Bronze Gate Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-111-LF or T-111-LF or a comparable product by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Powell Valves

2. Description:

a. Standard: MSS SP-80, Type 2, NSF 61-G.

b. CWP Rating: 200 psig.

c. Body Material: ASTM B584 C87850 dezincification resistant bronze with integral seat and threaded bonnet.

d. Ends: Threaded or Solder.

e. Stem: Lead free silicon bronze.

f. Disc: Solid wedge, lead free bronze.

g. Packing: Asbestos free.

h. Handwhell: Malleable iron.

2.6 IRON GATE VALVES

A. Class 125, Ductile-Iron Resilient Wedge Gate Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model F-619-RWS (NRS) or F-607-RWS (OS&Y) or a comparable product by one of the following:

a. Clow

b. Mueller

2. Description:

a. Standard: AWWA C-509 and C-515,

b. CWP Rating: 300 psig.

c. Body Material: ASTM A-536 ductile iron, fusion-bonded epoxy coating inside and out.

d. Ends: Flanged.

e. Trim: stainless steel.

f. Disc: Rubber encapsulated ductile iron wedge.

g. Packing and Gasket: Asbestos free.

2.7 MANUAL CIRCUIT BALANCING VALVES

A. Bronze, Fixed Orifice, Balancing Valves (2" and smaller):

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model T/S-1810-LF or a comparable product by one of the following:

a. Or approved equal

2. Description:

a. CWP Rating: 300 psig

b. Maximum Operating Temperature: 260°F.

c. Body Material: Bronze or dezincification-resistant brass, lead free, Y-pattern globe type with fixed orifice (venture) for precise regulation and control. NO QUARTER TURN VALVES WILL BE ACCEPTED.

d. Plug: Bronze or dezincification-resistant brass with EPDM O-Rings.

e. Seat: Bronze or dezincification-resistant brass.

f. Ends: Threaded or Solder.

g. Pressure Gage Connections: Shall have two metering test ports with internal check and protective caps for use with portable differential pressure metering stations.

h. Handle Style: Calibrated hand wheel equipped with visual position readout and hidden memory stops for repeatable regulation and control.

B. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves (2-1/2" and larger):

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model F/G 737A or a comparable product by one of the following:

a. Tour & Andersson

2. Description:

a. CWP Rating: 240 psig

b. Maximum Operating Temperature: 250°F.

c. Body Material: Cast-iron or steel body, globe pattern with calibrated orifice. NO BUTTERFLY VALVES.

d. Stem Seals: EPDM O-Rings

e. Disc: EPDM coated cast-iron disc.

f. Seat: Bronze or dezincification brass.

g. Ends: Flanged or grooved.

h. Pressure Gage Connection: Integral seals for portable differential pressure meter.

i. Handle Style: Calibrated hand wheel equipped with visual position readout and concealed memory stops for repeatable regulation and control.

2.8 GAS SHUT-OFF COCKS:

A. Gas Shut-Off Cocks, Above Grade (4” and smaller):

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model T-FP-600-A or a comparable product by one of the following:

a. Or approved equal.

2. Description:

a. Standard: MSS SP-110

b. CWP Rating: 600 psig.

c. SWP Rating: 150 psig.

d. Gas Rating: CSA certified and UL/FM listed.

e. Body Design: Two piece with threaded body pack nut design (no threaded stem designs allowed) with adjustable stem packing.

f. Body Material: Dezincification-resistant brass.

g. Seats: PTFE

h. Ball: Chrome-plated brass

i. Ends: Threaded

j. Port: Full

B. Gas Shut-Off Cocks, Below Grade:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Nordstom “Poly-Gas” or comparable product by one of the following:

a. Or approved equal.

2. Description:

a. Standards: ASTM D-2513 and ANSI B16.40

b. Valve boxes: cast iron tops marked “GAS”, high-impact heavy-duty ABS valve can as manufactured by C.O. Test Services-VALVCO, Inc. or equal.

2.9 LPG SHUT-OFF COCKS:

A. LPG Shut-Off Cocks, Above Grade (3” and smaller):

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model T-585-70-UL (1/2” – 1”) and T-580-70-UL (1-1/4” – 3”) or a comparable product by one of the following:

a. Or approved equal.

2. Description:

a. Standard: MSS SP-110, CSA certified and UL/FM listed.

b. CWP Rating: 600 psig.

c. SWP Rating: 150 psig.

d. Gas Rating: 250 psi non-shock LP gas per UL842.

e. Body Design: Two piece with threaded body pack nut design (no threaded stem designs allowed) with adjustable stem packing.

f. Body Material: Dezincification-resistant brass.

g. Seats: PTFE

h. Ball: Chrome-plated brass

i. Ends: Threaded

j. Port: Full port (1/2” – 1”), conventional port (1-1/4” – 3”)

B. LPG Shut-Off Cocks, Below Grade:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Nordstom “Poly-Gas” or comparable product by one of the following:

a. Or approved equal.

2. Description:

a. Standards: ASTM D-2513 and ANSI B16.40

b. Valve boxes: cast iron tops marked “GAS”, high-impact heavy-duty ABS valve can as manufactured by C.O. Test Services-VALVCO, Inc. or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.

2. Check Valves: In horizontal or vertical position, between flanges.

3. Lift Check Valves: With stem upright and plumb.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly valves.

2. Butterfly Valve Dead-End Service: Single-flange (lug) type.

3. Throttling Service: Ball or Butterfly valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends.
3. For Steel Piping, NPS 2 and Smaller: Threaded ends.
4. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: Threaded ends.
2. Ball Valves: Two piece, full port, bronze with stainless-steel trim.
3. Bronze Lift Check Valves: Class 125, nonmetallic TFE disc.
4. Bronze Swing Check Valves: Class 150, nonmetallic TFE disc.
5. Bronze Gate Valves: Class 150, RS.

B. Pipe NPS 2-1/2 and Larger:

1. Ductile-Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.

END OF SECTION

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.

2. Trapeze pipe hangers.

3. Thermal-hanger shield inserts.

4. Fastener systems.

B. Related Sections:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.6 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.7 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.8 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.9 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.10 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.11 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.12 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

   a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

   b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

   c. Include all pertinent construction, installation, performance and technical data.

   d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

      1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

      2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

   e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

   a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

      1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".

   b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.13 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.14 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.15 RECORD DRAWINGS

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.16 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 Pipe Supports: Unless otherwise indicated on the drawings, shall be as follows:

A. The Contractor shall furnish and install all miscellaneous iron work including angles, channels, etc., required to appropriately support the various piping systems. Hanger spacing and location shall conform to 2016 California Plumbing Code Table 313.1.

B. All horizontal runs of piping within the building to be supported from the structural framing with steel rods and split ring hangers, B-Line, Grinnell Company, Tolco, or approved equal. Steel rods shall be secured to overhead framing with side beam connectors. Where necessary, install angle iron between framing to accommodate hanger rods. Where several pipes are running together, Unistrut, B-Line or Powerstrut channels with clamps may be used in lieu of individual pipe hangers, and supported from structure as herein specified. Submit test data for type of hanger supports to be provided. For support conditions other than specified herein, the Contractor shall submit method of support for approval prior to any installation.

C. Horizontal Piping Hangers and Supports:

1. General: Provide factory fabricated horizontal hangers and supports complying with one of the following MSS types listed to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.

a. Adjustable Steel Clevis Hangers: (MSS Type 1.) B-Line B 3100

b. Adjustable Swivel Pipe Rings: (MSS Type 5) B-Line B3690

D. Vertical-Piping Clamps:

1. General: Provide factory fabricated vertical-piping clamps complying with the following types listed, to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.

2. Two-Bolt Riser Clamps: (MSS Type 8) B-Line B3373

E. Hanger-Rod Attachments:

1. General: Provide factory fabricated hanger-rod attachments B-Line, Tolco or approved equal, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-58 and manufacturer's published product information. Select size of hanger-rod attachment to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.

2. Side beam eye socket, Tolco Fig. #57 for rod sizes 3/8" dia. and Tolco Fig. #25-30-251 for rod sizes 1/2" dia.

F. Building Attachments:

1. General: Provide factory fabricated building attachments, selected by Installer to suit building structural framing conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.

G. Hanger Rods and Spacing shall conform to the following table:

Pipe Sizes	Spacing	Rods
2 Inch and Smaller	6 Feet	3/8 Inch
2-1/2 Inch to 3 Inch	8 Feet	1/2 Inch
4 Inch and larger	8 Feet	5/8 Inch

H. Hangers and Supports shall be adequate to maintain alignment and prevent sagging and shall be placed within 18 inches of joint. Support shall be provided at each horizontal branch connection.

I. Provide lateral bracing as manufactured by B-Line or approved equal for all piping to prevent swaying or movement in accordance with SMACNA "Guidelines for Seismic Restraints of Piping Systems". Piping smaller than indicated in the guidelines shall be provided with bracing as specified for the smallest size indicated. The entire water distribution system shall be properly braced and will not move due to the action of quick closing of valves.

J. Miscellaneous Supports, Wall Brackets, Etc.: Provide where required in accordance with the best standard practices of the trade. Submit shop drawings for all fabricated supports.

2.2 Isolators. All piping which is not isolated from contact with the building by its insulation shall be installed with a manufactured type isolator. Isolators shall be B-Line vibra clamp and cushion, Super Strut, Stoneman "Trisolator", or approved equal. Piping shall be installed and supported in a manner to provide for expansion without strains. Guides shall be properly installed to ensure this requirement.

2.3 Shields:

A. General: Provide shields at piping hangers and supports, factory-fabricated, for all insulated piping as manufactured by Pipeshields Incorporated or approved equal. Size shields for exact fit to mate with pipe insulation.

1. Protection Shields: MSS Type 40; provide high density insert of same thickness of insulation or equal 100-psi average compressive strength, waterproofed calcium silicate, encased with a sheet metal shield. Insert and shield shall cover entire circumference of the pipe and shall be of length indicated by manufacturer for pipe size and thickness of insulation.

2.4 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.

2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.

3. Nonmetallic Coatings: Plastic coating, jacket, or liner.

4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.

2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.

2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.5 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.6 THERMAL-HANGER SHIELD INSERTS

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

1. ERICO International Corporation.

2. PHS Industries, Inc.

3. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.

4. Piping Technology & Products, Inc.

B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig ASTM C 552 or Type II cellular glass with 100-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.7 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.

2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.

2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

b. NPS 4: 12 inches long and 0.06 inch thick.

4. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.

5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and 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. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099123 "Interior Painting."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.

2. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.

2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.

3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.

4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

5. C-Clamps (MSS Type 23): For structural shapes.

6. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.

7. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

8. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

9. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

2. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 22 05 53

IDENITIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.

2. Warning signs and labels.

3. Pipe labels.

4. Valve tags.

5. Warning tags.

1.3 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.6 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.7 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.8 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.9 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.10 SUBMITTAL DATA

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

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

F. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

G. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.11 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

1.12 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.13 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.14 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.

2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

4. Fasteners: Stainless-steel rivets or self-tapping screws.

5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

H. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

2. Lettering Size: At least 1-1/2 incheshigh.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.

2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.5 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.

2. Fasteners: Brass grommet and wire.

3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."

4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Section 099123 "Interior Painting."

B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles on each piping system.

1. Identification Paint: Use for contrasting background.

2. Stencil Paint: Use for pipe marking.

C. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

D. Pipe Label Color Schedule:

1. Domestic Water Piping:

a. Background Color: White.

b. Letter Color: Black.

2. Sanitary Waste and Storm Drainage Piping:

a. Background Color: White.

b. Letter Color: Black.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Cold Water: 1-1/2 inches, round.

b. Hot Water: 1-1/2 inches, round.

2. Valve-Tag Color:

a. Cold Water: Natural.

b. Hot Water: Natural.

3. Letter Color:

a. Cold Water: Black.

b. Hot Water: Black.

3.5 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.

2. Domestic hot-water piping.

3. Supplies and drains for handicap-accessible lavatories and sinks.

B. Related Sections:

1. Section 220716 "Plumbing Equipment Insulation."

1.3 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.6 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.7 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.8 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.9 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.10 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

   a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

      1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

   b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.11 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.12 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.13 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.14 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.15 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

1.16 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.17 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.18 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Hot Water Pipe Insulation: All hot water supply and return piping, except exposed connections to plumbing fixtures, flanges and unions shall be insulated with ASTM C547, Class I, "Johns-Manville" "Micro-Lock" 850-APT, Owens-Corning Fiberglass Corp., ASJ/SL-11 or approved equal, 1" thick for sizes up to 2" and 1-1/2" thick for sizes 2" and larger with “Johns-Manville” “Zeston” pre-formed insulation inserts for all fittings. Insulation at all fittings shall be equal in thickness to insulation for piping. Insulation shall have a flame spread of not more than 25 and a smoke density not exceeding 50 per 2016 CMC

1. Exposed insulated piping in occupied areas and exposed outside the building shall be covered with Johns-Manville” “Zeston” 30-mil thick white PVC jacketing material per ASTM D1784 with “Johns-Manville” “Zeston” pre-formed insulation inserts for all fittings. Insulation at all fittings shall be equal in thickness to insulation for piping. Jacketing shall comply with ASTM E84, and shall have a flame spread of not more than 25 and a smoke density not exceeding 50 per 2016 CMC.

2. Hot water piping below slab shall have insulation protected by a 10-mil thick polyethylene plastic sleeve sealed watertight with poly vinyl chloride tape.

B. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

C. Products shall not contain asbestos, lead, mercury, or mercury compounds.

D. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

E. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

F. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

G. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Johns Manville; Micro-Lok.

b. Knauf Insulation; 1000-Degree Pipe Insulation.

c. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

H. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Armacell LLC; Tubolit.

b. Nomaco Insulation; IMCOLOCK and NOMALOCK.

I. Condensate Pipe Insulation: All condensate piping within the building shall be insulated with "Imcoa" "Imcolock" ¾" nominal wall thickness closed-cell insulation. Insulation shall have a flame spread of not more than 25 and a smoke density not exceeding 50 per 2016 CMC. All joints shall be mitered and secured with black duct tape.

J. Indirect Waste Pipe Insulation: All indirect waste drains from refrigerated kitchen equipment shall be insulated with "Armacell" "Armaflex" insulating tape.

K. All insulation shall be continuous through supports and hangers.

L. All fixtures complying with the provisions of the Americans with Disabilities Act shall be provided with Prowrap insulation for exposed hot water pipe, tailpiece, and trap as manufactured by McGuire, and secured per manufacturers recommendations. No tape wrapping shall be permitted.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.

b. Eagle Bridges - Marathon Industries; 225.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Phenolic Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-96.

b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-33.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.

b. Eagle Bridges - Marathon Industries; 225.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide the following:

a. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 428 AWF ASJ.

b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.

c. Compac Corporation; 104 and 105.

d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.

3. Thickness: 11.5 mils.

4. Adhesion: 90 ounces force/inch in width.

5. Elongation: 2 percent.

6. Tensile Strength: 40 lbf/inch in width.

7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 370 White PVC tape.

b. Compac Corporation; 130.

c. Venture Tape; 1506 CW NS.

2. Width: 2 inches.

3. Thickness: 6 mils.

4. Adhesion: 64 ounces force/inch in width.

5. Elongation: 500 percent.

6. Tensile Strength: 18 lbf/inch in width.

2.4 SECUREMENTS

A. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

2.5 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers,:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. McGuire Manufacturing.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.

2. Verify that surfaces to be insulated are clean and dry.

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

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.

2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.

3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.

2. Testing agency labels and stamps.

3. Nameplates and data plates.

4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.

4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.

4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.

2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.

4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.

4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.

4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.

3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

4. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF POLYOLEFIN INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.

4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of polyolefin pipe insulation.

2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install cut sections of polyolefin pipe and sheet insulation to valve body.

2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3. Install insulation to flanges as specified for flange insulation application.

4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.

2. Underground piping.

3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot and Recirculated Hot Water:

1. NPS 1-1/4 and Smaller: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

2. NPS 1-1/2 and Larger: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. All Pipe Sizes: Insulation shall be the following:

a. McGuire pre-insulated trap and supply covers.

END OF SECTION

SECTION 22 08 00

COMMISSIONING OF PLUMBING SYSTEMS

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. The OPR and BOD documentation are included by reference for information only.

1.2 SUMMARY

A. This section includes commissioning process requirements for Plumbing systems, assemblies, and equipment. Commissioning will be completed to meet the requirements of 2022 California Green Building Code ("CALGreen") and LEED™ Rating System, Version 4.

B. Related Sections:

1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

1.3 DESCRIPTION

A. Refer to Division 01 Section "General Commissioning Requirements" for the description of commissioning.

1.4 DEFINITIONS

A. Refer to Division 01 Section "General Commissioning Requirements" for definitions.

1.5 SUBMITTALS

A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's role.

B. Refer to Division 01 Section "Submittals" for specific requirements. In addition, provide the following:

C. Certificates of readiness

D. Certificates of completion of installation, prestart, and startup activities.

E. O&M manuals

F. Test reports

1.6 QUALITY ASSURANCE

A. Test Equipment Calibration Requirements: Contractors will comply with test manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.7 COORDINATION

A. Refer to Division 01 Section “General Commissioning Requirements” for requirements pertaining to coordination during the commissioning process.

1.8 TEST EQUIPMENT

A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the contractor for the equipment being tested. For example, the plumbing contractor of Division 22 shall ultimately be responsible for all standard testing equipment for the plumbing system in Division 22, except for equipment specific to and used by TAB in their commissioning responsibilities. A sufficient quantity of two-way radios shall be provided by each subcontractor.

B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the base bid price to the Owner and left on site, except for stand-alone data logging equipment that may be used by the CxA.

C. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon completion of the commissioning process.

D. Data logging equipment and software required to test equipment will be provided by the CxA, but shall not become the property of the Owner.

E. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

2. EXECUTION

2.1 GENERAL DOCUMENTATION REQUIREMENTS

A. The Installing Contractor shall prepare Pre-Functional Checklists for all commissioned components, equipment, and systems based on the manufacturers documentation and submit to the CxA for review and approval. This documentation shall be submitted with and within the same time frame as O&M literature.

B. Red-lined Drawings:

1. The contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.

2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.

3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.

4. The contracted party, as defined in the Contract Documents will create the as-built drawings.

C. Operation and Maintenance Data:

1. Contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems.

2. The CxA will review the O&M literature once for conformance to project requirements.

3. The CxA will receive a copy of the final approved O&M literature once corrections have been mad by the contractor.

D. Demonstration and Training:

1. Contractor will provide demonstration and training as required by the specifications.

2. A complete training plan and schedule must be submitted by the contractor to the CxA four weeks (4) prior to any training.

3. A training agenda for each training session must be submitted to the CxA one (1) week prior the training session.

4. The CxA shall be notified at least 72 hours in advance of scheduled tests so that testing may be observed by the CxA and Owner's representative. A copy of the test record shall be provided to the CxA, Owner, and Architect.

5. Engage a Factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specific equipment.

6. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, trouble shooting, servicing, and maintaining equipment.

7. Review data in O&M Manuals.

E. Systems manual requirements:

1. The Systems Manual is intended to be a usable information resource containing all of the information related to the systems, assemblies, and Commissioning Process in one place with indexes and cross references.

2. The GC shall include final approved versions of the following information for the Systems Manual:

a. As-Built System Schematics

b. Verified Record Drawings

c. Test Results (not otherwise included in Cx Record)

d. Periodic Maintenance Information for computer maintenance management system

e. Recommendations for recalibration frequency of sensors and actuators

f. A list of contractors, subcontractors, suppliers, architects, and engineers involved in the project along with their contact information

g. Training Records, Information on training provided, attendees list, and any on-going training

3. This information shall be organized and arranged by building system, such as fire alarm, chilled water, heating hot water, etc.

4. Information should be provided in an electronic version to the extent possible. Legible, scanned images are acceptable for non-electronic documentation to facilitate this deliverable.

2.2 CONTRACTOR'S RESPONSIBILITIES

A. Perform commissioning tests at the direction of the CxA.

B. Attend construction phase controls coordination meetings.

C. Attend domestic water balancing review and coordination meetings.

D. Participate in Plumbing systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.

E. Provide information requested by the CxA for final commissioning documentation.

F. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or sub-contract written.

G. Prepare preliminary schedule for Plumbing system orientations and inspections, operation and maintenance manual submissions, training sessions, pipe and duct system testing, flushing and cleaning, equipment start-up, testing and balancing and task completion for owner. Distribute preliminary schedule to commissioning team members.

H. Update schedule as required throughout the construction period.

I. During the startup and initial checkout process, execute prefunctional checklists for all commissioned equipment.

J. Assist the CxA in all verification and functional performance tests.

K. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

L. Gather operation and maintenance literature on all equipment and assemble in binders as required by the specifications. Submit to CxA (45) days after submittal acceptance.

M. Coordinate with the CxA to provide (48) hour advance notice so that the witnessing of equipment and system start-up and testing can begin.

N. Notify the CxA a minimum of (2) weeks in advance of the time for start of the balancing work. Attend the initial balancing meeting for review of the balancing procedures.

O. Participate in, and schedule vendors and contractors to participate in the training sessions.

P. Provide written notification to the GC and CxA that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.

1. Plumbing equipment including domestic water heaters, pumps, heat exchangers, plumbing fixtures, and all other equipment furnished under this Division.

2. Gas piping, condensate piping, and piping related to water reuse of condensate and/or stormwater.

Q. The equipment supplier shall document the performance of his equipment.

R. Provide a complete set of red-lined drawings to the CxA prior to the start of Functional Performance Testing.

S. Balance Contractor

1. Attend initial commissioning coordination meeting scheduled by the CxA.

2. Submit the site specific balancing plan to the CxA and Design Professional for review and acceptance.

3. Attend the balancing review meeting scheduled by the CxA. Be prepared to discuss the procedures that shall be followed in balancing the Plumbing system.

4. At the completion of the balancing work, and the submittal of the final balancing report, notify the Plumbing contractor and the CM/GC.

5. At the completion of balancing work, and the submittal of the final balancing report, notify the Plumbing Contractor and the CM/GC.

6. Participate in verification of the balancing report, which will consist of repeating measurements contained in the balancing reports. Assist in diagnostic purposes when directed.

T. Provide training of the Owner's operating staff using expert qualified personnel, as specified.

U. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner, to keep warranties in force.

2. Assist in equipment testing per agreements with contractors.

3. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.

V. Refer to Division 01 Section "General Commissioning Requirements" for additional contractor responsibilities.

2.3 OWNER'S RESPONSIBILITIES

A. Refer to Division 01 Section "General Commissioning Requirements" for Owner's Responsibilities.

2.4 DESIGN PROFESSIONAL'S RESPONSIBILITIES

A. Refer to Division 01 Section "General Commissioning Requirements" for Design Professional's Responsibilities.

2.5 CxA'S RESPONSIBILITIES

A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's Responsibilities.

2.6 TESTING PREPARATION

A. Certify in writing to the CxA that Plumbing systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify in writing to the CxA that Plumbing instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Certify in writing that balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

2.7 DOMESTIC WATER BALANCING VERIFICATION

A. Prior to performance of Domestic Water Balancing work, provide copies of reports, sample forms, checklists, and certificates to the CxA.

B. Notify the CxA at least ten (10) days in advance of testing and balancing work, and provide access for the CxA to witness balancing Work.

C. Provide technicians, instrumentation, and tools to verify testing and balancing of Plumbing systems at the direction of the CxA.

1. The CxA will notify testing and balancing subcontractor ten (10) days in advance of the date of field verification. Notice will not include data points to be verified.

2. The balancing subcontractor shall use the same instruments (by model and serial number) that were used when original data were collected.

3. Failure of an item includes a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final balancing report.

4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

2.8 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Scope of Plumbing testing shall include entire Plumbing installation. Testing shall include measuring capacities and effectiveness of operational and control functions.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the Plumbing contractor, balancing subcontractor shall prepare detailed testing plans, procedures, and checklists for Plumbing systems, subsystems, and equipment.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct that set points be altered when simulating conditions is not practical.

H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed because of a deficiency outside the scope of the Plumbing system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

2.9 PLUMBING SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual Division 22 sections. Provide submittals, test data, inspector record, and certifications to the CxA.

B. Plumbing Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in. Assist the CxA with preparation of testing plans.

C. Pipe system cleaning, flushing, hydrostatic tests, and chemical treatment: Test requirements are specified in Division 22 piping Sections. Plumbing Contractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA. Plan shall include the following:

1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.

2. Description of equipment for flushing operations.

3. Minimum flushing water velocity.

4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.

D. Plumbing Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of fuel gas, storm drainage piping, and domestic water distribution systems.

E. Vibration and Sound Tests: Provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation and seismic controls.

F. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems and sub-systems. The following equipment and systems shall be evaluated:

1. Gas Water Heater

2. Circulation Pump

3. Plumbing Fixtures

2.10 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT

A. Refer to Division 01 Section “General Commissioning Requirements” for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.

2.11 APPROVAL

A. Refer to Division 01 Section “General Commissioning Requirements” for approval procedures.

2.12 DEFERRED TESTING

A. Refer to Division 01 Section “General Commissioning Requirements” for requirements pertaining to deferred testing.

2.13 OPERATION AND MAINTENANCE MANUALS

A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements as stated in Division 01.

B. Refer to Division 01 Section “General Commissioning Requirements” for the AE and CxA roles in the Operation and Maintenance Manual contribution, review and approval process.

2.14 TRAINING OF OWNER PERSONNEL

A. Refer to Division 01 Section “General Commissioning Requirements” for requirements pertaining to training.

B. Plumbing Contractor. The mechanical contractor shall have the following training responsibilities:

1. Provide the CxA with a training plan two weeks before the planned training.

2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of Plumbing equipment.

3. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.

4. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer’s representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.

5. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.

6. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.

7. The plumbing contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls.

8. Training shall occur after functional testing is complete, unless approved otherwise by the Owner.

END OF DOCUMENT

SECTION 22 11 16

DOMESTIC WATER PIPING

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. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

2. Encasement for piping.

B. Related Requirements:

1. Section 221113 "Facility Water Distribution Piping" for water-service piping outside the building from source to the point where water-service piping enters the building.

1.3 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.6 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.7 UTILITIES

A. See Drawings for Points of Connection.

B. Certain site utilities are to be connected to and extended. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact location and depth of lines to which he is to connect. In event depth of lines is not sufficient to permit connection in manner indicated, Contractor shall obtain direction from the Owner's representative before proceeding with this work.

C. Verify that utility companies size their services and meters to suit ultimate demand indicated on the drawings.

D. Domestic Water: The Contractor shall be responsible for the domestic water service outside of the building within five feet (5') of the foundation, and within the building itself. See Civil Engineer's plans for onsite domestic water system.

E. Domestic Water Service: The Contractor shall arrange with the serving utility company for the installation of all water meter assemblies and reduced pressure backflow devices, including the service mains and vaults, and all required appurtenances as indicated on the drawings and in accordance with serving utility standards and shall pay all costs incurred. All required capacity fees, frontage fees and inspections, shall be paid for by the Owner. Contractor shall provide necessary tap-in connections in water main for sterilizing of domestic water system. Contractor shall connect into the main water service line as indicated on the drawings. The installation shall be in accordance with the serving utility company's standards.

1.8 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.9 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.10 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.11 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

   a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

   b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

   c. Include all pertinent construction, installation, performance and technical data.

   d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

      1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

      2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

   e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

   a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

      1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".

   b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.12 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.13 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

1.14 FIELD CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of water service.

2. Do not interrupt water service without Architect's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Piping within the building and above grade shall be Type "L" ASTM B88, hard drawn copper tubing with wrought copper sweat fittings ANSI B16.18 and B16.22,

B. Outdoor underground piping in sizes 2-1/2" and 3" shall be Type "L" ASTM B88, hard drawn copper as specified for water piping within the building. Piping 2" and smaller shall be Type "K" ASTM B88, hard drawn copper with wrought copper sweat fittings ANSI B16.18 and B16.22.

C. Piping below the building floor shall be Type "K" soft annealed copper tubing with no fittings below the slab.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

E. Copper Unions:

1. MSS SP-123.

2. Cast-copper-alloy, hexagonal-stock body.

3. Ball-and-socket, metal-to-metal seating surfaces.

4. Solder-joint or threaded ends.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.

2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105/A21.5.

B. Form: Sheet or tube.

C. Color: natural.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install underground copper tube in PE encasement according to ASTM A 674 or AWWA C105/A21.5.

D. Install shutoff valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install domestic water piping level without pitch and plumb.

G. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

H. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

J. Install piping to permit valve servicing.

K. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

L. Install piping free of sags and bends.

M. Install fittings for changes in direction and branch connections.

N. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

O. Install thermometers on outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."

P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.

2. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 2 and Smaller: 72 inches with 3/8-inch rod.

2. NPS 2-1/2 to NPS 3: 8 feet with 1/2-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.

2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.

3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.6 PIPE AND EQUIPMENT IDENTIFICATION

A. Each operating and service line shut-off valve shall be identified by a 19 ga. brass tag with stamped, engraved type of service identified and area served, complete with hole and brass chain mounted on valve stem or handle. Tag shall be a minimum of one and one-half inch (1-1/2") in diameter.

B. All piping systems shall be readily identifiable by appropriate labeling with the name of the piping contained. Such labeling shall be by means of metal tags, stenciling, stamping, or with adhesive markers, in a manner that is not readily removable. Labeling shall appear on the piping at intervals of not more than 20 ft and at least once in each room and each story traversed by the piping system.

C. Provide on exterior wall of each building opposite the building's main gas service a sign reading "Gas Shut Off". Sign shall be metal with minimum 1-1/2" high-embossed letters.

1. All equipment shall be provided with name plate indicating all pertinent information on it

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.

2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.

d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.

c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.

d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.8 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.

2. Open shutoff valves to fully open position.

3. Open throttling valves to proper setting.

4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.

b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.

6. Remove and clean strainer screens. Close drain valves and replace drain plugs.

7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.

8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.9 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours. Operate all valves during the retention period.

2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours. Operate all valves during the retention period.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Repeat procedures if biological examination shows contamination.

e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.10 TESTING

A. No piping work shall be concealed or covered until piping has been tested, inspected and approved by the Inspector. All piping for plumbing systems shall be completely installed and tested as required by the Uniform Plumbing Code. Test pressures and times indicated are a minimum only. All tests shall be as required by the governing authority as well.

3.11 OPERATION INSTRUCTION

A. Prior to occupancy or prior to the date of final inspection, whichever may occur first, the Contractor shall prepare two (2) sets of typewritten instructions for the operation of all equipment, valves, etc., specified and furnished as a part of the work under this section, and shall assign a competent person, thoroughly familiar with the job, to demonstrate and instruct a representative of the Owner in the operation of the equipment. The time of said demonstration and instructions shall be arranged with the Owner's representative approximately one (1) week in advance. Verbal instructions shall include shut-off location of gas and water. The Contractor shall assemble all operation and maintenance data supplied by the manufacturers of the various pieces of equipment, all keys and special wrenches required to operate and service the equipment (including keys for yard boxes, gas stops and fixture stops), and all equipment warranties and deliver same to the representative of the Owner on date of said instructions.

3.12 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be the following:

1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

E. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be the following:

1. Soft copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

F. Aboveground domestic water piping shall be the following:

1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.

3.13 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller. Use butterfly valves with flanged ends for piping NPS 2-1/2 and larger.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 22 11 16

SECTION 22 11 19

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Vacuum breakers.

2. Backflow preventers.

3. Water pressure-reducing valves.

4. Balancing valves.

5. Temperature-actuated, water mixing valves.

6. Hose bibbs.

7. Water-hammer arresters.

8. Trap-seal primer valves.

9. Trap-seal primer systems.

B. Related Requirements:

1. Section 223200 "Domestic Water Filtration Equipment" for water filters in domestic water piping.

2. Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.

3. Section 224300 "Medical Plumbing Fixtures" for thermostatic mixing valves for sitz baths, thermostatic mixing-valve assemblies for hydrotherapy equipment, and outlet boxes for dialysis equipment.

4. Section 224500 "Emergency Plumbing Fixtures" for water tempering equipment.

5. Section 224713 "Drinking Fountains" for water filters for water coolers.

6. Section 224716 "Electric Water Coolers" for water filters for water coolers.

1.3 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.6 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.7 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.8 UTILITIES

A. See Drawings for Points of Connection.

B. Certain site utilities are to be connected to and extended. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact location and depth of lines to which he is to connect. In event depth of lines is not sufficient to permit connection in manner indicated, Contractor shall obtain direction from the Owner's representative before proceeding with this work.

C. Verify that utility companies size their services and meters to suit ultimate demand indicated on the drawings.

D. Domestic Water: The Contractor shall be responsible for the domestic water service outside of the building within five feet (5') of the foundation, and within the building itself. See Civil Engineer's plans for onsite domestic water system.

E. Domestic Water Service: The Contractor shall arrange with the serving utility company for the installation of all water meter assemblies and reduced pressure backflow devices, including the service mains and vaults, and all required appurtenances as indicated on the drawings and in accordance with serving utility standards and shall pay all costs incurred. All required capacity fees, frontage fees and inspections, shall be paid for by the Owner. Contractor shall provide necessary tap-in connections in water main for sterilizing of domestic water system. Contractor shall connect into the main water service line as indicated on the drawings. The installation shall be in accordance with the serving utility company's standards.

1.9 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.10 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.11 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.12 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.13 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.14 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.15 GUARANTEES (Also see General Conditions)

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

1.16 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 and NSF 14.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Ames Fire & Waterworks; a division of Watts Water Technologies, Inc.

b. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.

c. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.

3. Standard: ASSE 1001.

4. Size: NPS 1/4 to NPS 3 (DN 8 to DN 80), as required to match connected piping.

5. Body: Bronze.

6. Inlet and Outlet Connections: Threaded.

7. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.

    b. Woodford Manufacturing Company; a division of WCM Industries, Inc.

    c. Zurn Industries, LLC; Plumbing Products Group; Light Commercial Products.

    d. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.

3. Standard: ASSE 1011.

4. Body: Bronze, nonremovable, with manual drain.

5. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.

6. Finish: Rough bronze.

C. Pressure Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Ames Fire & Waterworks; a division of Watts Water Technologies, Inc.

    b. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.

    c. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.

3. Standard: ASSE 1020.

4. Operation: Continuous-pressure applications.

5. Pressure Loss: 5 psig maximum, through middle third of flow range.

6. Size: See plans.

7. Design Flow Rate: See plans.

8. Selected Unit Flow Range Limits: See plans.

9. Accessories:

    a. Valves: Ball type, on inlet and outlet.

D. Laboratory-Faucet Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.

b. Woodford Manufacturing Company; a division of WCM Industries, Inc.

c. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.

3. Standard: ASSE 1035.

4. Size: NPS 1/4 or NPS 3/8 (DN 8 or DN 10) matching faucet size.

5. Body: Bronze.

6. End Connections: Threaded.

7. Finish: Chrome plated.

2.4 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Symmons Industries, Inc.

b. Bradley.

3. Standard: ASSE 1017.

4. Pressure Rating: 125 psig (860 kPa).

5. Type: Thermostatically controlled, water mixing valve.

6. Material: Bronze body with corrosion-resistant interior components.

7. Connections: Threaded[**union**] inlets and outlet.

8. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.

9. Tempered-Water Setting: 120°F.

10. Tempered-Water Design Flow Rate: 0.35 GPM.

11. Valve Finish: Rough bronze.

B. Primary, Thermostatic, Water Mixing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Symmons Industries, Inc.

b. Bradley.

3. Standard: ASSE 1017.

4. Pressure Rating: 125 psig (860 kPa)minimum unless otherwise indicated.

5. Type: Exposed-mounted or Cabinet-type (Refer to Plumbing Fixture Schedule), thermostatically controlled, water mixing valve.

6. Material: Bronze body with corrosion-resistant interior components.

7. Connections: Threaded**[union]** inlets and outlet.

8. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.

9. Tempered-Water Setting: 120°F.

10. Tempered-Water Design Flow Rate: 0.35 GPM.

11. Selected Valve Flow Rate at 45-psig (310-kPa) Pressure Drop: 0.35 GPM.

12. Valve Finish: Rough bronze.

13. Piping Finish: Copper.

14. Cabinet: Factory fabricated, stainless steel, for recessed or surface **(**Refer to Plumbing Fixture Schedule) mounting and with hinged, stainless-steel door.

C. Individual-Fixture, Water Tempering Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Symmons Industries, Inc.

b. Bradley.

3. Standard: ASSE 1016, thermostatically controlled, water tempering valve.

4. Pressure Rating: 125 psig (860 kPa) minimum unless otherwise indicated.

5. Body: Bronze body with corrosion-resistant interior components.

6. Temperature Control: Adjustable.

7. Inlets and Outlet: Threaded.

8. Finish: Rough or chrome-plated bronze.

9. Tempered-Water Setting: 110°F**.**

10. Tempered-Water Design Flow Rate: 0.35 GPM.

D. Primary Water Tempering Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Symmons Industries, Inc.

b. Bradley.

3. Standard: ASSE 1017, thermostatically controlled, water tempering valve, listed as tempering valve.

4. Pressure Rating: 125 psig (860 kPa) minimum unless otherwise indicated.

5. Body: Bronze.

6. Temperature Control: Manual.

7. Inlets and Outlet: Threaded.

8. Selected Primary Water Tempering Valve Size: See plans.

9. Tempered-Water Setting: 120°F.

10. Tempered-Water Design Flow Rate: See plans.

11. Tempered-Water Outlet Size: See plans for end connection.

12. Cold-Water Inlet Size: See plans for end connection.

13. Hot-Water Inlet Size: See plans for end connection.

14. Valve Finish: Rough bronze.

2.5 OUTLET BOXES

A. Clothes Washer Outlet Boxes:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Acorn Engineering Company.

b. Guy Gray Manufacturing Co., Inc.

c. IPS Corporation.

d. Symmons Industries, Inc.

e. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.

f. Whitehall Manufacturing; a div. of Acorn Engineering Company.

g. Zurn Industries, LLC; Plumbing Products Group; Light Commercial Products.

3. Mounting: Recessed.

4. Material and Finish: Plastic box and faceplate.

5. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.

6. Supply Shutoff Fittings: NPS 1/2 (DN 15) gate, globe, or ball valves and NPS 1/2 (DN 15) copper, water tubing.

7. Drain: NPS 2 (DN 50) standpipe and P-trap for direct waste connection to drainage piping.

8. Inlet Hoses: Two 60-inch- (1500-mm-) long, rubber household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.

9. Drain Hose: One 48-inch- (1200-mm-) long, rubber household clothes washer drain hose with hooked end.

B. Icemaker Outlet Boxes:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Acorn Engineering Company.

b. IPS Corporation.

3. Mounting: Recessed.

4. Material and Finish Plastic box and faceplate.

5. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 (DN 15) or smaller copper tube outlet.

6. Supply Shutoff Fitting: NPS 1/2 (DN 15) gate, globe, or ball valve and NPS 1/2 (DN 15) copper, water tubing.

2.6 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.

2. Body Material: Bronze.

3. Seat: Bronze, replaceable.

4. Supply Connections: NPS 3/4 threaded or solder-joint inlet.

5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.

6. Pressure Rating: 125 psig.

7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.

8. Include operating key with each operating-key hose bibb.

2.7 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

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

a. Precision Plumbing Products, Inc.

b. Zurn Industries, LLC; Plumbing Products Group; Specification Drainage Products.

2. Standard: ASSE 1010 or PDI-WH 201.

3. Type: Metal bellows.

4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.8 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

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

a. MIFAB, Inc.

b. Precision Plumbing Products, Inc.

c. Sioux Chief Manufacturing Company, Inc.

2. Standard: ASSE 1018.

3. Pressure Rating: 125 psig minimum.

4. Body: Bronze.

5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.

6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.

7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.9 TRAP-SEAL PRIMER SYSTEMS

A. Trap-Seal Primer Systems:

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

a. Precision Plumbing Products, Inc.

2. Standard: ASSE 1044.

3. Piping: NPS 3/4, ASTM B 88, Type L; copper, water tubing.

4. Cabinet: Surface-mounted steel box with stainless-steel cover.

5. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.

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.

6. Vacuum Breaker: ASSE 1001.

7. Number Outlets: Four.

8. Size Outlets: NPS 1/2.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install water-hammer arresters in water piping according to PDI-WH 201.

B. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

C. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

3.2 Access Panels:

A. Wall access panels shall be minimum 12" x 12" for concealed valves and other equipment unless otherwise specified or indicated. Ceiling access panels shall be 18" x 18" minimum. Access panels shall be located and positioned for ready access and service of equipment housed within. Where access panels are specified with keyed cylinder locks, all such locks shall be identically keyed.

1. Wall, Non-Fire Rated: Elmdor/Stoneman DW-SS-CL, drywall, stainless steel finish, cylinder lock.

2. Ceiling, Non-fire Rated: Elmdor/Stoneman DW, drywall, prime coated finish, screwdriver latch.

3. Wall, Fire Rated: Elmdor/Stoneman FR-SS-CL, fire rated, stainless steel finish, cylinder lock.

4. Ceiling, Fire rated: Elmdor/Stoneman FRC, Fire rated, prime coated finish, return latch.

5. Wall, Non-Fire Rated: Elmdor/Stoneman DW-SS-AKL, drywall, stainless steel finish, allen key latch.

6. Ceiling, Non-fire Rated: Elmdor/Stoneman DW, drywall, prime coated finish, screwdriver latch.

7. Wall, Fire Rated: Elmdor/Stoneman FR-SS, fire rated, stainless steel finish, return latch.

8. Ceiling, Fire rated: Elmdor/Stoneman FRC, Fire rated, prime coated finish, return latch.

3.3 CONNECTIONS

A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Supply-type, trap-seal primer valves.

2. Trap-seal primer systems.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

A. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

B. Prepare test and inspection reports.

3.6 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION

SECTION 22 11 23

FACILITY NATURAL-GAS PIPING

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. Pipes, tubes, and fittings.

2. Piping specialties.

3. Piping and tubing joining materials.

4. Valves.

5. Pressure regulators.

6. Concrete bases.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.5 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.6 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.

2. Service Regulators: 65 psig minimum unless otherwise indicated.

B. Natural-Gas System Pressure within Buildings: 0.5 psig or less.

1.7 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.8 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.9 UTILITIES

A. See Drawings for Points of Connection.

B. Certain site utilities are to be connected to and extended. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact location and depth of lines to which he is to connect. In event depth of lines is not sufficient to permit connection in manner indicated, Contractor shall obtain direction from the Owner's representative before proceeding with this work.

C. Verify that utility companies size their services and meters to suit ultimate demand indicated on the drawings.

D. Gas Service and Meter Assembly: The Contractor shall arrange with the serving utility company for the installation of new gas service with complete meter assembly of the capacity indicated and in the location as shown on the drawings. All items served with gas shall be operated at full fire and adjusted by the Contractor. In cooperation with gas utility, make all required adjustments to main gas pressure regulators. The Owner shall pay for all required fees.

1.10 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.11 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.12 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.13 SUBMITTAL DATA

A. Product Data: For each type of the following:

1. Piping specialties.

2. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.

3. Pressure regulators. Indicate pressure ratings and capacities.

4. Dielectric fittings.

B. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

C. Substitution Requirements:

1. Product Data: For each type of the following:

a. Piping specialties.

b. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.

c. Pressure regulators. Indicate pressure ratings and capacities.

d. Dielectric fittings.

2. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

3. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

4. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

5. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

6. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.14 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. 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.

1.15 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

D. Protect stored PE pipes and valves from direct sunlight.

1.16 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of natural-gas service.

2. Do not proceed with interruption of natural-gas service without Construction Manager's written permission.

1.17 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 Gas Piping:

A. Concealed gas piping within the building shall be Schedule 40 black steel pipe conforming to ASTM A-53 using 150 pound banded malleable iron screwed fittings for piping 2" and smaller and weld type steel fittings for piping 2-1/2" and larger.

B. Exposed gas piping outside the building shall be Schedule 40 galvanized steel pipe conforming to ASTM A-53 using galvanized 150 pound banded galvanized malleable iron screwed fittings for piping in sizes 2" and smaller and seamless weld type steel fittings for all piping in sizes 2-1/2" and larger.

C. Underground gas piping shall be SDR-11 Polyethylene PE2406 (Yellow) as manufactured by Driscoplex. Fittings shall be socket fusion weld Polyethylene as manufactured by Performance Pipe or Central, PE2406 (Yellow) complying with ASTM, D2513. Where required provide "Lyco" or Double "O" seal transition fittings between steel and polyethylene as manufactured by Central, all identified and approved for gas service. A 14 gauge copper tracer wire shall be installed with and attached to piping and shall terminate above grade at each end. Underground polyethylene piping shall be installed by personnel certified by the pipe manufacturer as having received instructions directly from the pipe manufacturer's field representative. Contractors not having certified personnel will be required to have a factory representative of the pipe manufacturer visit the site at the time of underground pipe installation and provide the required instructions. All required cost for training and certification shall be paid for by Contractor.

1. Upon completion of the gas piping underground installation, Contractor shall submit a written report directly to the Architect stating that all materials installed are as specified and approved, and that installation was performed by factory certified personnel and tested to 60 P.S.I.

2. All piping on roof shall be supported by pipe supports as manufactured by MAPA Products. Products by Miro Industries and Erico shall be accepted for submittal review.

a. Pressurized Piping:

1) For pipe sizes 1” and less: MS-1 single post, adjustable height pipe support.

2) For pipe sizes 2 ½” and less: MS-4 adjustable, roller pipe support.

3) For pipe sizes 4” and less: MS-5 adjustable, roller pipe support.

b. Gravity System Piping 2” and Less: MS-1 single post, adjustable height pipe support.

3. All underground non-metallic piping shall have 14 gauge copper "Tracer Wire" continuous for entire length.

2.2 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.

2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.

3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.

4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

a. Material Group: 1.1.

b. End Connections: Threaded or butt welding to match pipe.

c. Lapped Face: Not permitted underground.

d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.

e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.

f. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

B. PE Pipe: ASTM D 2513, SDR 11.

1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.

2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

3. Anodeless Service-Line Risers: Factory fabricated and leak tested.

a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.

b. Aboveground Portion: PE transition fitting.

c. Outlet shall be threaded or flanged or suitable for welded connection.

d. Tracer wire connection.

e. Ultraviolet shield.

f. Stake supports with factory finish to match steel pipe casing or carrier pipe.

4. Transition Service-Line Risers: Factory fabricated and leak tested.

a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.

b. Outlet shall be threaded or flanged or suitable for welded connection.

c. Bridging sleeve over mechanical coupling.

d. Factory-connected anode.

e. Tracer wire connection.

f. Ultraviolet shield.

g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

5. Plastic Mechanical Couplings,NPS 1-1/2 and Smaller: Capable of joining PE pipe to PE pipe.

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

1) Lyall, R. W. & Company, Inc.

2) Mueller Co.; Gas Products Div.

3) Perfection Corporation; a subsidiary of American Meter Company.

b. PE body with molded-in, stainless-steel support ring.

c. Buna-nitrile seals.

d. Acetal collets.

e. Electro-zinc-plated steel stiffener.

6. Steel Mechanical Couplings: Capable of joining plain-end PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.

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

1) Dresser Piping Specialties; Division of Dresser, Inc.

2) Smith-Blair, Inc.

b. Stainless-steel flanges and tube with epoxy finish.

c. Buna-nitrile seals.

d. Stainless-steel bolts, washers, and nuts.

e. Factory-installed anode for steel-body couplings installed underground.

2.3 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.

2. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.

3. Corrugated stainless-steel tubing with polymer coating.

4. Operating-Pressure Rating: 0.5 psig.

5. End Fittings: Zinc-coated steel.

6. Threaded Ends: Comply with ASME B1.20.1.

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.

2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.

3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.

4. CWP Rating: 125 psig.

B. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.4 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.5 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.

2. Threaded Ends: Comply with ASME B1.20.1.

3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.

4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.

5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.

6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.

2. Flanged Ends: Comply with ASME B16.5 for steel flanges.

3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.

4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

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

a. McDonald, A. Y. Mfg. Co.

b. Nibco.

2. Body: Bronze, complying with ASTM B 584.

3. Ball: Chrome-plated bronze.

4. Stem: Bronze; blowout proof.

5. Seats: Reinforced TFE; blowout proof.

6. Packing: Threaded-body packnut design with adjustable-stem packing.

7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.

8. CWP Rating: 600 psig.

9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.

10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Bronze Plug Valves: MSS SP-78.

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

a. Lee Brass Company.

b. McDonald, A. Y. Mfg. Co.

2. Body: Bronze, complying with ASTM B 584.

3. Plug: Bronze.

4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.

5. Operator: Square head or lug type with tamperproof feature where indicated.

6. Pressure Class: 125 psig.

7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.

8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. PE Ball Valves: Comply with ASME B16.40.

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

   a. Kerotest Manufacturing Corp.

   b. Lyall, R. W. & Company, Inc.

   c. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: PE.

3. Ball: PE.

4. Stem: Acetal.

5. Seats and Seals: Nitrile.

6. Ends: Plain or fusible to match piping.

7. CWP Rating: 80 psig.

8. Operating Temperature: Minus 20 to plus 140 deg F.

9. Operator: Nut or flat head for key operation.

10. Include plastic valve extension.

G. Valve Boxes:

1. Cast-iron, two-section box.

2. Top section with cover with "GAS" lettering.

3. Bottom section with base to fit over valve and barrel a minimum of 5 inches in diameter.

4. Adjustable cast-iron extensions of length required for depth of bury.

5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.6 EARTHQUAKE VALVES

A. Earthquake Valves: Comply with ASCE 25.

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

a. Pacific Seismic Products, Inc.

2. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.

3. Maximum Operating Pressure: 0.5 psig.

4. Cast-aluminum body with stainless-steel internal parts.

5. Nitrile-rubber, reset-stem o-ring seal.

6. Valve position, open or closed, indicator.

7. Composition valve seat with clapper held by spring or magnet locking mechanism.

8. Level indicator.

9. End Connections: Threaded for valves NPS 2 and smaller; flanged for valves NPS 2-1/2 and larger.

2.7 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.

2. Steel jacket and corrosion-resistant components.

3. Elevation compensator.

4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

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

a. American Meter Company.

b. Fisher Control Valves and Regulators; Division of Emerson Process Management.

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.

3. Springs: Zinc-plated steel; interchangeable.

4. Diaphragm Plate: Zinc-plated steel.

5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.

6. Orifice: Aluminum; interchangeable.

7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.

8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.

9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.

10. Overpressure Protection Device: Factory mounted on pressure regulator.

11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.

12. Maximum Inlet Pressure: 5psig.

2.8 Access Panels:

A. Wall access panels shall be minimum 12" x 12" for concealed valves and other equipment unless otherwise specified or indicated. Ceiling access panels shall be 18" x 18" minimum. Access panels shall be located and positioned for ready access and service of equipment housed within. Where access panels are specified with keyed cylinder locks, all such locks shall be identically keyed.

1. Wall, Non-Fire Rated: Elmdor/Stoneman DW-SS-CL, drywall, stainless steel finish, cylinder lock.

2. Ceiling, Non-fire Rated: Elmdor/Stoneman DW, drywall, prime coated finish, screwdriver latch.

3. Wall, Fire Rated: Elmdor/Stoneman FR-SS-CL, fire rated, stainless steel finish, cylinder lock.

4. Ceiling, Fire rated: Elmdor/Stoneman FRC, Fire rated, prime coated finish, return latch.

5. Wall, Non-Fire Rated: Elmdor/Stoneman DW-SS-AKL, drywall, stainless steel finish, allen key latch.

6. Ceiling, Non-fire Rated: Elmdor/Stoneman DW, drywall, prime coated finish, screwdriver latch.

7. Wall, Fire Rated: Elmdor/Stoneman FR-SS, fire rated, stainless steel finish, return latch.

8. Ceiling, Fire rated: Elmdor/Stoneman FRC, Fire rated, prime coated finish, return latch.

2.9 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

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

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to NFPA 54 to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Install underground, PE, natural-gas piping according to ASTM D 2774.

C. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.

2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.

3. Replace pipe having damaged PE coating with new pipe.

D. Install fittings for changes in direction and branch connections.

3.4 INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Verify final equipment locations for roughing-in.

K. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

L. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

M. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

N. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

O. Concealed Location Installations:

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.

2. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

a. Exception: Tubing passing through partitions or walls does not require striker barriers.

3. Prohibited Locations:

a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.

b. Do not install natural-gas piping in solid walls or partitions.

P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

Q. Connect branch piping from top or side of horizontal piping.

R. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

S. Do not use natural-gas piping as grounding electrode.

T. Install strainer on inlet of each line-pressure regulator.

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.5 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

D. Install earthquake valves aboveground outside buildings according to listing.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.

2. Cut threads full and clean using sharp dies.

3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.

4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.

5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.

2. Bevel plain ends of steel pipe.

3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

F. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.

2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 2 and Smaller: Maximum span, 6 feet; minimum rod size, 3/8 inch.

2. NPS 2-1/2 to NPS 3-1/2: Maximum span, 8feet; minimum rod size, 1/2 inch.

3.8 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install piping adjacent to appliances to allow service and maintenance of appliances.

C. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

A. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for piping and valve identification.

B. Each operating and service line shut-off valve shall be identified by a 19 ga. brass tag with stamped, engraved type of service identified and area served, complete with hole and brass chain mounted on valve stem or handle. Tag shall be a minimum of one and one-half inch (1-1/2") in diameter.

C. All piping systems shall be readily identifiable by appropriate labeling with the name of the piping contained. Such labeling shall be by means of metal tags, stenciling, stamping, or with adhesive markers, in a manner that is not readily removable. Labeling shall appear on the piping at intervals of not more than 20 ft and at least once in each room and each story traversed by the piping system.

D. Provide on exterior wall of each building opposite the building's main gas service a sign reading "Gas Shut Off". Sign shall be metal with minimum 1-1/2" high-embossed letters.

E. All equipment shall be provided with name plate indicating all pertinent information on it

3.10 PAINTING

A. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.

a. Prime Coat: Alkyd anticorrosive metal primer.

b. Intermediate Coat: Exterior alkyd enamel matching topcoat.

c. Topcoat: Exterior alkyd enamel flat.

d. Color: Gray.

B. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. No piping work shall be concealed or covered until piping has been tested, inspected and approved by the Inspector. All piping for plumbing systems shall be completely installed and tested as required by the Uniform Plumbing Code. Test pressures and times indicated are a minimum only. All tests shall be as required by the governing authority as well.

B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to NFPA 54 and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.12 DEMONSTRATION

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

3.13 OUTDOOR PIPING SCHEDULE

A. Underground natural-gas piping shall be:

1. PE pipe and fittings joined by heat fusion, or mechanical couplings; service-line risers with tracer wire terminated in an accessible location.

B. Aboveground natural-gas piping in exposed locations shall be one of the following:

1. Galvanized steel pipe with galvanized steel malleable-iron fittings and threaded joints.

2. Galvanized steel pipe with galvanized wrought-steel fittings and welded joints.

3.14 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

A. Aboveground piping NPS 2 and smaller shall be the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground piping NPS 2-1/2 and larger shall be the following:

1. Steel pipe with wrought-steel fittings and welded joints.

3.15 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Piping valves shall be the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.

END OF SECTION

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

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. Pipe, tube, and fittings.

2. Specialty pipe fittings.

3. Encasement for underground metal piping.

B. Related Sections:

1. Section 221313 "Facility Sanitary Sewers" for sanitary sewerage piping and structures outside the building.

1.3 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.6 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.7 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.8 UTILITIES

A. See Drawings for Points of Connection.

B. Certain site utilities are to be connected to and extended. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact location and depth of lines to which he is to connect. In event depth of lines is not sufficient to permit connection in manner indicated, Contractor shall obtain direction from the Owner's representative before proceeding with this work.

C. Verify that utility companies size their services and meters to suit ultimate demand indicated on the drawings.

D. Sanitary Sewer: The Contractor shall be responsible for the soil and waste piping outside of the building within five feet (5') of the foundation, and within the building itself. See Civil Engineer's plans for onsite sewer system.

1.9 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.10 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.11 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.12 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

   a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

   b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

   c. Include all pertinent construction, installation, performance and technical data.

   d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

      1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

      2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

   e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

   a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

      1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".

   b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.13 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.14 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

1.15 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of sanitary waste service.

2. Do not proceed with interruption of sanitary waste service without Architect's written permission.

1.16 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.17 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.18 GUARANTEES (Also see General Conditions)

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. ASTM C 1540, Heavy Duty, Hubless-Piping Couplings:

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

a. ANACO-Husky SD 4000 series.

b. MIFAB MI-QXHUB.

2. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Soil and waste piping within the building itself and outside within five feet (5') of the foundation, shall be no-hub cast iron pipe and fittings, asphaltum coated, free from defects, and shall comply with CISPI. Standard 301, ASTM A-888 or ASTM A-74. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute. Fittings shall be made up with "Husky" SD 4000 series or “MIFAB MI-QXHUB” series stainless steel type 304 couplings and shall conform to ASTM C1540 & ASTM C564 except all above ground vent pipe fittings may be made with "Anaco" or "MIFAB" stainless steel two band couplings conforming to CISPI Standard 310.

2.3 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Cleanouts to Grade: Jay R. Smith No. 4258 or Jay R. Smith No. 4253 with X-H bronze plug and X-X-H non-skid cover with lifting device set flush with surface for concrete areas. Asphalt or nonsurfaced areas shall be installed with ring of concrete poured around the bottom flange six inches (6") below surface. Use cast iron soil pipe on cleanout risers. For cleanouts in non-traffic areas, terminate cleanout plug in concrete yard box

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

a. Smith, Jay R. Mfg. Co.

b. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

3. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

4. Top-Loading Classification(s): Light Duty Medium Duty Heavy Duty and Extra-Heavy Duty.

5. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. Yard Boxes & Vaults: For service for cleanouts, shall be Brooks Products or Fraser Cement Products Co., rectangular concrete type with vandal-proof cast iron cover and name of service clearly marked on cover. Box shall be of size to permit full range of valve operation and to permit easy removal of valve assembly. Vaults shall be sectional type.

2.4 CORROSION PROTECTION

A. General.

1. Corrosion protection shall be provided for all below grade cast iron and copper piping and associated valves and fittings. Such piping shall be protected from corrosion by encasement in a polyethylene protective wrapping, referred to hereafter as polywrap. Although not intended to be a completely air and water tight enclosure, the polywrap shall provide a continuous barrier between the pipe and surrounding bedding and backfill.

B. Materials.

1. Cast iron piping encasement.

a. The polywrap shall be minimum 8 mil. in thickness, group 2, linear low density, flat tube, natural (clear) virgin polyethylene film formed into tubes or sheets as required. Material shall meet or exceed the requirements of AWWA C105, ANSI A21.5 and ASTM A674.

b. The polywrap shall be as manufactured by Northtown Company or approved equal.

2. The minimum Polywrap flat tube width for each pipe diameter shall be as follows:

Pipe Size / Type	Polywrap Flat Tube Width
2” to 3” cast iron	14”
4” cast iron	16”
6” cast iron	20”
8” cast iron	24”

3. The polywrap shall be secured as specified with 2 inch wide pressure sensitive plastic tape not less than 10 mils thick.

   a. Tape shall be Scotchwrap No. 50, Polyken No. 900, Tapecoat CT, Johns-Manville No. V-10 Trantex or approved equal.

4. Piping through exterior walls shall be sealed using Link Seal modular seal with nitrile seal elements and stainless steel bolts.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

L. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

M. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.

2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.

O. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."

2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."

P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

B. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.

2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.

3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.

4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.

5. Vertical Piping: MSS Type 8 or Type 42, clamps.

6. Install individual, straight, horizontal piping runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

8. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.

2. NPS 3: 60 inches with 1/2-inch rod.

3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.

4. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 84 inches with 3/8-inch rod.

2. NPS 1-1/2: 108 inches with 3/8-inch rod.

3. NPS 2: 10 feet with 3/8-inch rod.

4. NPS 2-1/2: 11 feet with 1/2-inch rod.

5. NPS 3: 12 feet with 1/2-inch rod.

6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.

I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.

2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.

3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.

4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.6 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

6. Prepare reports for tests and required corrective action.

3.8 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping shall be the following:

1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.

C. Aboveground, vent piping shall be the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.

D. Underground, soil, waste, and vent piping shall be the following:

1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.

END OF SECTION

SECTION 22 13 19

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Cleanouts.

2. Floor drains.

3. Trench drains.

4. Miscellaneous sanitary drainage piping specialties.

5. Grease interceptors.

B. Related Requirements:

1. Section 221423 "Storm Drainage Piping Specialties" for storm drainage piping inside the building, drainage piping specialties, and drains.

2. Section 224300 "Medical Plumbing Fixtures" for plaster sink interceptors.

3. Section 334100 "Storm Utility Drainage Piping" for storm draining piping and piping specialties outside the building.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FOG: Fats, oils, and greases.

C. HDPE: High-density polyethylene plastic.

1.4 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.5 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.6 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.7 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.8 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.9 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.10 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.11 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.12 SUBMITTAL DATA

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:

1. Grease interceptors.

B. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

   a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

   b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

   c. Include all pertinent construction, installation, performance and technical data.

   d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

      1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

      2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

   e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

C. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

   a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

      1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".

   b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.13 INFORMATIONAL SUBMITTALS

A. Manufacturer Seismic Qualification Certification: Submit certification that grease interceptors**,** accessories, and components will withstand seismic forces defined in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. 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."

b. 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. 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.

B. Field quality-control reports.

1.14 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.15 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.16 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.17 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.18 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

1.19 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate size and location of roof penetrations.

1.20 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Cultures: Provide 1-gal. bottles of bacteria culture recommended by manufacturer of FOG disposal systems equal to 200 percent of amount installed, but no fewer than 2 1-gal. bottles.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

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

a. Zurn

b. JR Smith

c. Watts

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.

3. Size: Same as connected drainage piping

4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.

5. Closure: Countersunk, brass plug.

6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Metal Floor Cleanouts:

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

   a. Zurn

   b. JR Smith

   c. Watts

2. Standard: ASME A112.36.2M for cast-iron soil pipe with cast-iron ferrule threaded, adjustable housing cleanout.

3. Size: Same as connected branch.

4. Type: Cast-iron soil pipe with cast-iron ferrule Threaded, adjustable housing.

5. Body or Ferrule: Cast iron.

6. Outlet Connection: Threaded.

7. Closure: Brass plug with tapered threads.

8. Adjustable Housing Material: Cast iron with set-screws or other device.

9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.

10. Frame and Cover Shape: Round.

11. Top Loading Classification: Heavy Duty.

12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

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

   a. Zurn

   b. JR Smith

   c. Watts

2. Standard: ASME A112.36.2M. Include wall access.

3. Size: Same as connected drainage piping.

4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.

5. Option for drilled-and-threaded plug in first subparagraph below is for a screw for a wall cover plate.

6. Closure: Countersunk, brass plug.

7. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

8. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

9. Wall Access: stainless-steel wall-installation frame and cover.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

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

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Zurn

b. JR Smith

c. Watts

3. Standard: ASME A112.6.3.

4. Pattern: Floor drain.

5. Body Material: Gray iron.

6. Seepage Flange: Required.

7. Anchor Flange: Required.

8. Clamping Device: Required.

9. Outlet: Bottom.

10. Coating in first subparagraph below is usually used only on sanitary floor drains.

11. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel.

12. Sediment Bucket: Not required.

13. Top or Strainer Material: Nickel bronze.

14. Top of Body and Strainer Finish: Nickel bronze.

15. Top Shape: Round.

B. Stainless-Steel Floor Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Josam Company.

3. Standard: ASME A112.3.1.

4. Outlet: Bottom.

5. Top or Strainer Material: Stainless steel.

6. Top Shape: Round.

7. Trap-Primer Connection: Required.

2.3 TRENCH DRAINS

A. Trench Drains:

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

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Zurn

b. JR Smith

c. Watts

3. Standard: ASME A112.6.3 for trench drains.

4. Material: Ductile or gray iron.

5. Flange: Anchor.

6. Clamping Device: Required.

7. Outlet: Bottom.

8. Grate Material: Ductile iron.

9. Grate Finish: Painted.

10. Top Loading Classification: Medium Duty.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.

2. Size: Same as connected stack vent or vent stack.

2.5 SAND/OIL INTERCEPTORS

A. Sand/Oil Interceptors:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Jensen Precast.

3. Standard: ASME A112.14.3 and PDI-G101, for intercepting and retaining fats, oils or -processing wastewater.

4. PDI certification is currently limited to 50-gpm (3.15-L/s) flow rate and 100-lb (45.4-kg) grease retention by PDI-G101. Larger uncertified units are available. PDI-G101 is being revised, should be available by end of 2003, and will include capacities to 100 gpm (6.3 L/s).

5. Plumbing and Drainage Institute Seal: Not required.

6. Rate in subparagraph below is limited to 100 gpm (6.3 L/s).

7. Capacity in first subparagraph below is limited to 200 lb (90.7 kg).

8. Sand/Oil Retention Capacity: 1000 Gallon.

9. Inlet and Outlet Size: 4”

10. Cleanout: Integral or field installed on outlet.

11. Mounting: Recessed, flush with floor.

12. Operation: Manual cleaning.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting:

1. Install grease interceptors on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 03 30 00 "Cast-in-Place Concrete." Section 03 30 53 "Miscellaneous Cast-in-Place Concrete."

2. Comply with requirements for vibration isolation and seismic control devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment"

3. Comply with requirements for vibration isolation devices specified in Section 22 05 48.13 "Vibration Controls for Plumbing Piping and Equipment."

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.

2. Locate at each change in direction of piping greater than 45 degrees.

3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.

4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.

2. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface, unless otherwise indicated.

G. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

H. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

I. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.

J. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.

2. Size: Same as floor drain inlet.

K. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

L. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

M. Install vent caps on each vent pipe passing through roof.

N. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

O. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

P. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

Q. Install grease interceptors, venting according to authorities having jurisdiction and with clear space for servicing.

1. Flush with Floor Installation: Set unit and extension, if required, with cover flush with finished floor

2. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

R. Install wood-blocking reinforcement for wall-mounting-type specialties.

S. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 22 13 16 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Grease Interceptors: Connect inlet and outlet to unit, and connect flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.

D. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.

2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.

2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.

3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 07 62 00 "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Grease interceptors.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain grease removal devices. Refer to Section 01 79 00 "Demonstration and Training."

END OF SECTION

SECTION 22 14 13

STORM DRAIN PIPING

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. Pipe, tube, and fittings.

2. Specialty pipe fittings.

3. Encasement for underground metal piping.

B. Related Sections:

1. Section 221429 "Sump Pumps" for storm drainage pumps.

2. Section 334100 "Storm Utility Drainage Piping" for storm drainage piping outside the building.

1.3 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water.

2. Storm Drainage, Force-Main Piping: 150 psig.

B. Seismic Performance: Storm drainage piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.6 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.7 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.8 UTILITIES

A. See Drawings for Points of Connection.

B. Certain site utilities are to be connected to and extended. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact location and depth of lines to which he is to connect. In event depth of lines is not sufficient to permit connection in manner indicated, Contractor shall obtain direction from the Owner's representative before proceeding with this work.

C. Verify that utility companies size their services and meters to suit ultimate demand indicated on the drawings.

D. Storm Drain: The Contractor shall be responsible for the storm drain service outside of the building within five feet (5') of the foundation, and within the building itself. See Civil Engineer's plans for onsite storm drain system.

1.9 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.10 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.11 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.12 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

   a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

   b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

   c. Include all pertinent construction, installation, performance and technical data.

   d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

      1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

      2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

   e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

   a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

      1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".

   b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.13 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For storm drainage piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.14 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

1.15 PROJECT CONDITIONS

A. Interruption of Existing Storm-Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of storm-drainage service.

2. Do not proceed with interruption of storm-drainage service without Architect's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Storm Drain Piping:

1. Concealed storm drain piping within the building itself and outside within five feet (5') of the foundation, shall be no-hub cast iron pipe and fittings, asphaltum coated, free from defects, and shall comply with CISPI. Standard 301, ASTM A-888 or ASTM A-74. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute. Fittings shall be made up

with "Husky" SD 4000 series or “Clamp All” HI-TORQ 125 series stainless steel type 304 couplings and shall conform to ASTM C 1540 & ASTM C564.

2. Exposed storm drain piping shall be Schedule 40 galvanized steel pipe, ASTM A53, with black cast iron recessed drainage fittings.

C. Sub-soil Drainage System:

1. Piping: PVC, SDR-35 perforated pipe with solid wall fittings and solvent-cemented joints. Perforations shall be 1/4" diameter on 3" centers, 120 degrees between two rows parallel to pipe axis. Install per pipe manufacturer's directions.

2.2 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. CISPI, Hubless-Piping Couplings:

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

a. ANACO-Husky SD 4000 series.

b. Clamp All HI_TORQ 125 series.

2. Standards: ASTM C 1277 and CISPI 310.

3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.3 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Material: High-density, crosslaminated PE film of 0.004-inch or LLDPE film of 0.008-inch minimum thickness.

C. Form: Tube.

D. Color: Black.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations from layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

K. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

L. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

M. Install storm drainage piping at the following minimum slopes unless otherwise indicated:

1. Building Storm Drain: 1% downward in direction of flow for piping NPS 3 and smaller; 1% downward in direction of flow for piping NPS 4 and larger unless noted otherwise on drawings.

2. Horizontal Storm-Drainage Piping: 1% downward in direction of flow unless noted otherwise on drawings.

N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

O. Install steel piping according to applicable plumbing code.

P. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

Q. Install aboveground ABS piping according to ASTM D 2661.

R. Install aboveground PVC piping according to ASTM D 2665.

S. Install engineered siphonic drain specialties and storm drainage piping in locations indicated.

T. Install underground, ductile-iron, force-main piping according to AWWA C600. Install buried piping inside building between wall and floor penetrations and connection to storm sewer piping outside building with restrained joints. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.

1. Install encasement on piping according to ASTM A 674 or AWWA C105.

U. Install underground, copper, force-main tubing according to CDA's "Copper Tube Handbook."

1. Install encasement on piping according to ASTM A 674 or AWWA C105.

V. Install force mains at elevations indicated.

W. Plumbing Specialties:

1. Install backwater valves in storm drainage gravity-flow piping. Comply with requirements for backwater valves specified in Section 221423 "Storm Drainage Piping Specialties."

2. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping. Comply with requirements for cleanouts specified in Section 221423 "Storm Drainage Piping Specialties."

3. Install drains in storm drainage gravity-flow piping. Comply with requirements for drains specified in Section 221423 "Storm Drainage Piping Specialties."

X. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

Y. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

Z. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

AA. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hub-and-Spigot, Cast-Iron Soil Piping Calked Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.

C. Hubless, Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Join copper tube and fittings with soldered joints according to ASTM B 828 procedure. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

F. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fittings. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

G. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

H. Plastic, Nonpressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

3.4 VALVE INSTALLATION

A. General valve installation requirements are specified in Section 220523 "General-Duty Valves for Plumbing Piping."

B. Shutoff Valves: Install shutoff valve on each sump pump discharge.

1. Install gate or full-port ball valve for piping NPS 2 and smaller.

2. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing-check valve, between pump and shutoff valve, on each sump pump discharge.

D. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.

2. Install backwater valves in accessible locations.

3. Comply with requirements for backwater valves specified in Section 221423 "Storm Drainage Piping Specialties."

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.

2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.

3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.

4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.

5. Vertical Piping: MSS Type 8 or Type 42, clamps.

6. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

8. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.

2. NPS 3: 60 inches with 1/2-inch rod.

3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.

4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.

5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.

6. Spacing for 10-foot pipe lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Install supports for vertical copper tubing every 10 feet.

I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.

2. Install horizontal backwater valves with cleanout cover flush with floor.

3. Comply with requirements for backwater valves cleanouts and drains specified in Section 221423 "Storm Drainage Piping Specialties."

D. Connect force-main piping to the following:

1. Storm Sewer: To exterior force main.

2. Sump Pumps: To sump pump discharge.

E. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

F. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed storm drainage piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.

2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Test Procedure: Test storm drainage piping on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.

4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

5. Prepare reports for tests and required corrective action.

E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

4. Prepare reports for tests and required corrective action.

3.9 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION

SECTION 22 14 23

STORM DRAIN PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Roof drains.

2. Miscellaneous storm drainage piping specialties.

3. Cleanouts.

4. Flashing materials.

1.3 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water.

2. Storm Drainage, Force-Main Piping: 150 psig.

B. Seismic Performance: Storm drainage piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.6 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.7 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.8 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.9 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.10 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.11 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.12 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For storm drainage piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.13 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

1.14 PROJECT CONDITIONS

A. Interruption of Existing Storm-Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of storm-drainage service.

2. Do not proceed with interruption of storm-drainage service without Architect's written permission.

B. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

C. Fasteners: Metal compatible with material and substrate being fastened.

D. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

E. Solder: ASTM B 32, lead-free alloy.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

A. Cast-Iron, Large-Sump, General-Purpose Roof Drains:

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

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Zurn

b. JR Smith

c. Watts

3. Standard: ASME A112.6.4, for general-purpose roof drains.

4. Body Material: Cast iron.

5. Dimension of Body: Nominal 15-inch diameter.

6. Combination Flashing Ring and Gravel Stop: Required.

7. Outlet: Bottom.

8. Extension Collars: Required.

9. Underdeck Clamp: Required.

10. Sump Receiver Plate: Required.

11. Dome Material: Cast iron.

12. Perforated Gravel Guard: Stainless steel.

13. Vandal-Proof Dome: Required.

14. Overflow Drain Water Dam: 2 inches.

2.2 MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

A. Downspout Adaptors:

1. Description: Manufactured, gray-iron casting, for attaching to horizontal-outlet, parapet roof drain and to exterior, sheet metal downspout.

2. Size: Inlet size to match parapet drain outlet.

B. Downspout Boots:

1. Description: Manufactured, ASTM A 48/A 48M, gray-iron casting, with strap or ears for attaching to building; NPS 4 (DN 100) outlet; and shop-applied bituminous coating.

2. Size: Inlet size to match downspout and NPS 4 (DN 100) outlet.

C. Conductor Nozzles:

1. Description: Bronze body with threaded inlet and bronze wall flange with mounting holes.

2. Size: Same as connected conductor.

2.3 CLEANOUTS

A. Floor Cleanouts:

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

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Zurn

b. JR Smith

c. Watts.

3. Standard: ASME A112.36.2M, for adjustable housing cleanouts.

4. Size: Same as connected branch.

5. Type: Adjustable housing.

6. Body or Ferrule Material: Cast iron.

7. Clamping Device Required.

8. Outlet Connection: Spigot.

9. Closure: Cast-iron plug.

10. Adjustable Housing Material: Cast iron with threads

11. Frame and Cover Material and Finish: Stainless steel.

12. Frame and Cover Shape: Round.

13. Top-Loading Classification: Heavy Duty.

14. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

B. Test Tees:

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

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Zurn

b. JR Smith

c. Watts

3. Standard: ASME A112.36.2M and ASTM A 74, ASTM A 888, or CISPI 301, for cleanout test tees.

4. Size: Same as connected drainage piping.

5. Body Material: Hub-and-spigot, cast-iron soil-pipe T-branch or hubless, cast-iron soil-pipe test tee as required to match connected piping.

6. Closure Plug: Countersunk.

7. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

C. Wall Cleanouts:

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

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Zurn

b. JR Smith.

c. Watts

3. Standard: ASME A112.36.2M, for cleanouts. Include wall access.

4. Size: Same as connected drainage piping.

5. Body Material Hubless, cast-iron soil-pipe test tee as required to match connected piping.

6. Closure: Countersunk or raised-head cast-iron plug.

7. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

8. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

9. Wall Access: Round stainless-steel wall-installation frame and cover.

2.4 TRENCH DRAINS

A. Trench Drains:

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

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Z

b. JR Smith

c. Watts

3. Standard: ASME A112.6.3, for trench drains.

4. Body Material: Cast iron.

5. Flange: Anchor with weep holes as required.

6. Clamping Device: Refer to Plumbing Fixture Schedule.

7. Outlet: Bottom.

8. Grate Material: See to Plumbing Fixture Schedule.

9. Grate Finish: See to Plumbing Fixture Schedule.

10. Dimensions of Frame and Grate: See Plumbing Fixture Schedule.

11. Top-Loading Classification: Heavy Duty.

2.5 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

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

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. ProSet Systems Inc.

3. Standard: ASTM E 814, for through-penetration firestop assemblies.

4. Certification and Listing**:** Intertek Testing Service NA for through-penetration firestop assemblies.

5. Size: Same as connected pipe.

6. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.

7. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.

8. Special Coating: Corrosion resistant on interior of fittings.

2.6 FLASHING MATERIALS

A. Copper Sheet: ASTM B 152/B 152M,12 oz./sq. ft.

B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

D. Fasteners: Metal compatible with material and substrate being fastened.

E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

F. Solder: ASTM B 32, lead-free alloy.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.

2. Install expansion joints, if indicated, in roof drain outlets.

3. Position roof drains for easy access and maintenance.

B. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:

1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.

2. Locate cleanouts at each change in direction of piping greater than 45 degrees.

3. Locate cleanouts at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install test tees in vertical conductors and near floor.

F. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221413 "Facility Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of 6.0-lb/sq. ft. lead sheets, 0.0938-inch thickness or thicker. Solder joints of 4.0-lb/sq. ft. lead sheets, 0.0625-inch thickness or thinner.

2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching the pipe size, with a minimum length of 10 inches and with skirt or flange extending at least 8 inches around pipe.

2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.

3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 22 15 13

GENERAL-SERVICE COMPRESSED –AIR PIPING

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 piping and related specialties for general-service compressed-air systems operating at 200 psig or less.

B. Related Sections include the following:

1. Section 22 15 19 "General-Service Packaged Air Compressors and Receivers" for general-service air compressors and accessories.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. CR: Chlorosulfonated polyethylene synthetic rubber.

C. EPDM: Ethylene-propylene-diene terpolymer rubber.

D. HDPE: High-density polyethylene plastic.

E. NBR: Acrylonitrile-butadiene rubber.

F. PE: Polyethylene plastic.

G. PVC: Polyvinyl chloride plastic.

H. High-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures between 150 and 200 psig (1035 and 1380 kPa).

I. Low-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures of 150 psig (1035 kPa) or lessWORK INCLUDED

J. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.6 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.7 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.8 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.9 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.10 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Compressed-air piping and support and installation shall withstand effects of seismic events determined according to SEI/ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

1.11 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.12 FIELD CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of water service.

2. Do not interrupt water service without Architect's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Piping within the building and above grade shall be Type "L" ASTM B88, hard drawn copper tubing with wrought copper sweat fittings ANSI B16.18 and B16.22,

B. Outdoor underground piping in sizes 2-1/2" and 3" shall be Type "L" ASTM B88, hard drawn copper as specified for water piping within the building. Piping 2" and smaller shall be Type "K" ASTM B88, hard drawn copper with wrought copper sweat fittings ANSI B16.18 and B16.22

C. Piping below the building floor shall be Type "K" soft annealed copper tubing with no fittings below the slab.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

E. Copper Unions:

1. MSS SP-123.

2. Cast-copper-alloy, hexagonal-stock body.

3. Ball-and-socket, metal-to-metal seating surfaces.

4. Solder-joint or threaded ends.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.

2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105/A21.5.

B. Form: Sheet or tube.

C. Color: natural.

2.5 QUICK COUPLINGS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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

1. Amflo

C. General Requirements for Quick Couplings: Assembly with locking-mechanism feature for quick connection and disconnection of compressed-air hose.

D. Automatic-Shutoff Quick Couplings: Straight-through brass body with O-ring or gasket seal and stainless-steel or nickel-plated-steel operating parts.

E. Valveless Quick Couplings: Straight-through brass body with stainless-steel or nickel-plated-steel operating parts.

1. Socket End: With O-ring or gasket seal, without valve, and with barbed inlet for attaching hose.

2. Plug End: With barbed outlet for attaching hose.

2.6 HOSE ASSEMBLIES

A. Furnish and install the overhead air and water hose reels as indicated on the drawings and as herein specified. Overhead reel assemblies shall be as manufactured by Grover Standard Enclosed Ceiling Reels, as listed below, or approved equal. The units shall be completely enclosed type with end panels, service hoses, control and accessories as specified.

1. Each reel assembly shall include the following items:

2. 1106 #513 water reel with 4240 1/4" x 20' service hose, 980P control and 502 bibb.

3. 1107 #513 air reel with 4300 1/4" x 25' service hose, 918 control, air coupler and 908 truck type tire inflator with 60D adaptor.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping concealed from view and protected from physical contact by building occupants, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and to coordinate with other services occupying that space.

E. Install piping adjacent to equipment and machines to allow service and maintenance.

F. Install air and drain piping with 1 percent slope downward in direction of flow.

G. Install nipples, flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating, unless otherwise indicated.

H. Equipment and Specialty Flanged Connections:

1. Use steel companion flange with gasket for connection to steel pipe.

2. Use cast-copper-alloy companion flange with gasket and brazed or soldered joint for connection to copper tube. Do not use soldered joints for connection to air compressors or to equipment or machines producing shock or vibration.

I. Flanged joints may be used instead of specified joint for any piping or tubing system.

J. Extended-tee outlets with brazed branch connection may be used for copper tubing, within extruded-tee connection diameter to run tube diameter ratio for tube type, according to Extruded Tee Connections Sizes and Wall Thickness for Copper Tube (Inches) Table in ASTM F 2014.

K. Install eccentric reducers where compressed-air piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.

L. Install branch connections to compressed-air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.

M. Install thermometer and pressure gage on discharge piping from each air compressor and on each receiver. Comply with requirements in Section 22 05 19 "Meters and Gages for Plumbing Piping."

N. Install piping to permit valve servicing.

O. Install piping free of sags and bends.

P. Install fittings for changes in direction and branch connections.

Q. Install seismic restraints on piping. Seismic-restraint devices are specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints for Steel Piping: Join according to AWS D10.12/D10.12M.

E. Brazed Joints for Copper Tubing: Join according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Join according to ASTM B 828 or CDA's "Copper Tube Handbook."

G. Extruded-Tee Outlets for Copper Tubing: Form branches according to ASTM F 2014, with tools recommended by procedure manufacturer, and using operators qualified according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Use asbestos-free, nonmetallic gasket suitable for compressed air. Join flanges with gasket and bolts according to ASME B31.9 for bolting procedure.

I. Grooved Joints: Assemble couplings with housing, gasket, lubricant, and bolts. Join according to AWWA C606 for grooved joints. Do not apply lubricant to prelubricated gaskets.

J. Heat-Fusion Joints for PE Piping: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657 for socket-fusion joints.

K. Pressure-Sealed Joints: Join with tools recommended by fitting manufacturer, using operators qualified according to Part 1 "Quality Assurance" Article.

L. Solvent-Cemented Joints for ABS Piping: Clean and dry joining surfaces. Join according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

2. Join according to ASME B31.9 for solvent-cemented joints and to ASTM D 2235 Appendix.

M. Solvent-Cemented Joints for PVC Piping: Clean and dry joining surfaces. Join according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

2. Apply primer and join according to ASME B31.9 for solvent-cemented joints and to ASTM D 2672.

N. Dissimilar Metal Piping Material Joints: Use dielectric fittings.

3.3 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Section 220523 "General-Duty Valves for Plumbing Piping."

B. Install shutoff valves and unions or flanged joints at compressed-air piping to air compressors.

C. Install shutoff valve at inlet to each automatic drain valve, filter, lubricator, and pressure regulator.

D. Install check valves to maintain correct direction of compressed-air flow to and from compressed-air piping specialties and equipment.

3.4 CONNECTIONS

A. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment and machine.

B. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment and machine.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.

2. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 2 and Smaller: 72 inches with 3/8-inch rod.

2. NPS 2-1/2 to NPS 3: 8 feet with 1/2-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.

2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.

3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.7 LABELING AND IDENTIFICATION

A. Install identifying labels and devices for general-service compressed-air piping, valves, and specialties. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. Perform field tests and inspections.

B. Tests and Inspections:

1. Piping Leak Tests for Metal Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous nitrogen to pressure of 50 psig above system operating pressure, but not less than 150 psig. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.

2. Piping Leak Tests for ABS Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous nitrogen, at temperature of 110° F or less, to pressure of 40 psig above system operating pressure, but not less than **80 psig, 100 psig** or more than 120 psig . Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.

3. Piping Leak Tests for HDPE Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous nitrogen, at temperature of 100° F or less, to pressure of 40 psig above system operating pressure, but not less than **100 psig, 125 psig, 150 psig** or more than 180 psig. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.

4. Repair leaks and retest until no leaks exist.

5. Inspect filters, lubricators, and pressure regulators for proper operation.

C. Prepare test reports.

END OF SECTION

SECTION 22 15 19

GENERAL-SERVICE AIR COMPRESSORS AND RECIEVERS

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. Lubricated, reciprocating air compressors.

2. Oil-free, reciprocating air compressors.

3. Oilless, reciprocating air compressors.

4. Oil-free, rotary-screw air compressors.

5. Oil-flooded, rotary-screw air compressors.

6. Oil-free, rotary, sliding-vane air compressors.

7. Oil-sealed, rotary, sliding-vane air compressors.

8. Inlet-air filters.

9. Air-cooled, compressed-air aftercoolers.

10. Water-cooled, compressed-air aftercoolers.

11. Refrigerant compressed-air dryers.

12. Desiccant compressed-air dryers.

13. Computer interface cabinet.

1.3 DEFINITIONS

A. Actual Air: Air delivered from air compressors. Flow rate is delivered compressed air measured in acfm.

B. Standard Air: Free air at 68 deg F and 1 atmosphere before compression or expansion and measured in scfm.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.6 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.7 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.8 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.9 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.10 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.11 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

1. Air-Compressor, Inlet-Air-Filter Elements: Equal to 100% percent of amount installed, but no fewer than 1 units.

2. Belts: One for each belt-driven compressor.

1.12 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.13 RECORD DRAWINGS

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.14 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

1.15 FIELD CONDITIONS

A. Interruption of Existing Compressed-Air Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of compressed-air service.

2. Do not proceed with interruption of compressed-air service without Architect's, written permission.

1.16 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

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.

B. ASME Compliance: Fabricate and label receivers to comply with ASME Boiler and Pressure Vessel Code.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design compressed-air equipment mounting.

B. Seismic Performance: Compressed-air equipment shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.3 GENERAL REQUIREMENTS FOR PACKAGED AIR COMPRESSORS AND RECEIVERS

A. General Description: Factory-assembled, -wired, -piped, and -tested; electric-motor-driven; air-cooled; continuous-duty air compressors and receivers that deliver air of quality equal to intake air.

B. Control Panels: Automatic control station with load control and protection functions. Comply with NEMA ICS 2 and UL 508.

1. Enclosure: NEMA ICS 6, Type 12 control panel unless otherwise indicated.

2. Motor Controllers: Full-voltage, combination magnetic type with undervoltage release feature and motor-circuit-protector-type disconnecting means and short-circuit protective device.

3. Control Voltage: 120-V ac or less, using integral control power transformer.

4. Motor Overload Protection: Overload relay in each phase.

5. Starting Devices: Hand-off-automatic selector switch in cover of control panel, plus pilot device for automatic control.

6. Automatic control switches to alternate lead-lag compressors for duplex air compressors.

7. Instrumentation: Include discharge-air pressure gage, air-filter maintenance indicator, hour meter, compressor discharge-air and coolant temperature gages, and control transformer.

C. Receivers: Steel tank constructed according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

1. Pressure Rating: At least as high as highest discharge pressure of connected compressors, and bearing appropriate code symbols.

2. Interior Finish: Corrosion-resistant coating.

3. Accessories: Include safety valve, pressure gage, drain, and pressure-reducing valve.

D. Mounting Frame: Fabricate mounting and attachment to pressure vessel with reinforcement strong enough to resist packaged equipment movement during a seismic event when base is anchored to building structure.

2.4 LUBRICATED, RECIPROCATING AIR COMPRESSORS

A. Manufacturers: Subject to compliance with requirements, provide products by 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. Ingersoll-Rand; Air Solutions Group.

C. Compressor(s): Lubricated, reciprocating-piston type with lubricated compression chamber and crankcase.

1. Submerged gear-type oil pump.

2. Oil filter.

3. Combined high discharge-air temperature and low lubrication-oil pressure switch.

4. Belt guard totally enclosing pulleys and belts.

D. Capacities and Characteristics:

1. Air Compressor(s): One; two stage.

a. Intercooler between stages of two-stage units.

2. Standard-Air Capacity of Each Air Compressor: 16 scfm free air.

3. Actual-Air Capacity of Each Air Compressor: 24 acfm delivered.

4. Discharge-Air Pressure: 175 psi max.

5. Intake-Air Temperature: 32°-100° F.

6. Mounting: Tank mounted.

7. Motor (Each Air Compressor):

a. Horsepower: 7.5.

b. Speed: 1600 rpm.

8. Electrical Characteristics:

a. Volts: 460.

b. Phase: Three.

c. Hertz: 60.

9. Receiver: ASME construction steel tank.

a. Arrangement: Vertical.

b. Capacity: 80.

c. Drain: Manual valve.

2.5 INLET-AIR FILTERS

A. Description: Combination inlet-air filter-silencer, suitable for remote installation, for each air compressor.

1. Construction: Weatherproof housing for replaceable, dry-type filter element, with silencer tubes or other method of sound reduction.

2. Capacity: Match capacity of air compressor, with filter having collection efficiency of 99 percent retention of particles larger than 10 micrometers.

B. Description: Combination inlet-air filter-silencer, suitable for remote installation, for multiple air compressors.

1. Construction: Weatherproof housing for replaceable, dry-type filter element, with silencer tubes or other method of sound reduction.

2. Capacity: Match total capacity of connected air compressors, with filter having collection efficiency of 99 percent retention of particles larger than 10 micrometers.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Equipment Mounting:

1. Install air compressors on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in.

2. Install on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in.

3. Comply with requirements for vibration isolation and seismic control devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment"

4. Comply with requirements for vibration isolation devices specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."

B. Install compressed-air equipment anchored to substrate.

C. Arrange equipment so controls and devices are accessible for servicing.

D. Maintain manufacturer's recommended clearances for service and maintenance.

E. Install the following devices on compressed-air equipment:

1. Thermometer, Pressure Gage, and Safety Valve: Install on each compressed-air receiver.

2. Pressure Regulators: Install downstream from air compressors.

3. Automatic Drain Valves: Install on aftercoolers, receivers, and dryers. Discharge condensate over nearest floor sink close to compressor.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221513 "General-Service Compressed-Air Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to machine, allow space for service and maintenance.

3.3 IDENTIFICATION

A. Identify general-service air compressors and components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

2. Check for lubricating oil in lubricated-type equipment.

3. Check belt drives for proper tension.

4. Verify that air-compressor inlet filters and piping are clear.

5. Check for equipment vibration-control supports and flexible pipe connectors, and verify that equipment is properly attached to substrate.

6. Check safety valves for correct settings. Ensure that settings are higher than air-compressor discharge pressure, but not higher than rating of system components.

7. Check for proper seismic restraints.

8. Drain receiver tanks.

9. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

10. Test and adjust controls and safeties.

3.5 DEMONSTRATION

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

END OF SECTION

SECTION 22 16 16

CONDENSATE DRAIN PIPING

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. Pipe, tube, and fittings.

2. Specialty pipe fittings.

B. Related Sections:S

1. Section 221619 “Condensate Drain Piping Specialties" for sanitary sewerage piping and structures outside the building.

1.3 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Single-Wall Piping Pressure Rating: 10-foot head of water.

A. Delegated Design: Design seismic restraints for aboveground piping, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.6 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.7 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.8 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.9 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.10 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.11 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.12 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.13 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

1.14 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of sanitary waste service.

2. Do not proceed with interruption of sanitary waste service without Architect's written permission.

1.15 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.16 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.17 GUARANTEES (Also see General Conditions)

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Indirect Waste Piping.

1. Shall be Type "L" copper as specified for water piping.

C. Air Conditioning Condensate Drain Piping.

1. Shall be Type "M" copper as specified for water piping.

2.2 COPPER TUBE AND FITTINGS:

A. Hard Copper Tube: ASTM B 88, Type M tube, drawn temper.

B. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

C. Copper Unions:

1. MSS SP-123.

2. Cast-copper-alloy, hexagonal-stock body.

3. Ball-and-socket, metal-to-metal seating surfaces.

4. Solder-joint or threaded ends

2.3 SPECIALTY PIPE FITTINGS

A. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

2. Dielectric Unions:

a. Manufacturers: Subject to compliance with requirements, provide products by the following:

1) Wilkins; a Zurn company.

b. Description:

1) Standard: ASSE 1079.

2) Pressure Rating: 150 psig.

3) End Connections: Solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of condensate drain piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install condensate drain piping with 1 percent slope downward toward drain.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping at indicated slopes.

G. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Install unions in copper tubing at connection to each piece of equipment, machine, and specialty.

L. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

M. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

A. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

B. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

3.3 SPECIALTY PIPE FITTING INSTALLATION

A. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.

2. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.

b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

4. Base of Vertical Piping: MSS Type 52, spring hangers

5. Vertical Piping: MSS Type 8 or Type 42, clamps.

6. Install individual, straight, horizontal piping runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

8. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 and Smaller: 72 inches with 3/8-inch rod.

2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect drainage and vent piping to the following:

1. Plumbing Specialties: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.

2. Install test tees (wall cleanouts) in conductors near floor.

3. Equipment: Connect drainage piping as indicated. Provide union for each connection.

C. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

D. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

3.6 IDENTIFICATION

A. Identify exposed condensate drain piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.

2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.

d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill condensate drain piping. Check components to determine that they are not air bound and that piping is full of water.

b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.

c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.

d. Cap and subject piping to static water pressure of 50 psig. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

f. Prepare reports for tests and for corrective action required.

B. Condensate drain piping will be considered defective if it does not pass tests and inspections

C. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

D. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

3.8 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, condensate drain piping NPS 2 and smaller, shall be the following:

1. Hard copper tube, ASTM B 88, Type M copper, soilder-joint fittings; and soldered joints.

END OF SECTION

SECTION 22 34 00

FUEL-FIRED, DOMESTIC-WATER HEATERS

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. Commercial, gas-fired, high-efficiency, storage, domestic-water heaters.

2. Domestic-water heater accessories.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Commercial domestic-water heaters shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.5 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.6 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.7 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.8 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.9 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.10 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.11 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.12 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

1.13 QUALITY ASSURANCE

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.

B. ASHRAE/IESNA Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.

C. ASME Compliance:

1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61, "Drinking Water System Components - Health Effects."

1.14 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.15 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.16 WARRANTY

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.

b. Faulty operation of controls.

c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Periods: From date of Substantial Completion.

a. Commercial, Gas-Fired, Storage, Domestic-Water Heaters:

1) Storage Tank: Five years.

2) Controls and Other Components: Two years.

b. Compression Tanks: Five years.

PART 2 - PRODUCTS

2.1 COMMERCIAL, GAS-FIRED, STORAGE, WATER HEATERS

A. Commercial, Gas-Fired, High-Efficiency, Storage, Domestic-Water Heaters:

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

a. AO Smith.

b. Bradford White

c. Rheem

d. Lochinvar.

2. Standard: ANSI Z21.10.3/CSA 4.3.

3. Description: Manufacturer's proprietary design to provide at least 84 percent combustion efficiency at optimum operating conditions.

4. Storage-Tank Construction: ASME-code steel with 150-psig minimum working-pressure rating.

a. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

1) NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.

2) NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

5. Factory-Installed Storage-Tank Appurtenances:

a. Anode Rod: Replaceable magnesium.

b. Dip Tube: Required unless cold-water inlet is near bottom of tank.

c. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.

d. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.

e. Jacket: Steel with enameled finish.

f. Burner or Heat Exchanger: Comply with UL 795 or approved testing agency requirements for gas-fired, high-efficiency, domestic-water heaters and natural-gas fuel.

g. Temperature Control: Adjustable thermostat.

h. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.

i. Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4-M. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

B. Capacity and Characteristics: See Water Heater Schedule.

2.2 WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

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

a. Wilkins.

b. AMTROL Inc.

c. Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.

d. Taco, Inc.

2. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

3. Construction:

a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.

b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

c. Air-Charging Valve: Factory installed.

4. Capacity and Characteristics:

a. Working-Pressure Rating: 150 psig.

b. Capacity Acceptable: 4 gal. minimum.

5. Tank Cage:

a. Mapa

B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.

C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2.

D. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.

E. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

F. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4-M.

G. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Provide dimension that will support bottom of domestic-water heater a minimum of 18 inches above the floor.

H. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

I. Indirect Waste Piping:

1. Shall be Type "L" copper as specified for water piping.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect assembled domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.

C. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Maintain manufacturer's recommended clearances.

2. Arrange units so controls and devices that require servicing are accessible.

3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

5. Install anchor bolts to elevations required for proper attachment to supported equipment.

6. Anchor domestic-water heaters to substrate.

B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523 "General-Duty Valves for Plumbing Piping."

C. Install gas-fired, domestic-water heaters according to NFPA 54.

1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.

D. Install commercial domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

E. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

F. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."

G. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

H. Fill domestic-water heaters with water.

I. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."

B. Comply with requirements for gas piping specified in Section 221123 "Facility Natural-Gas Piping."

C. Drawings indicate general arrangement of piping, fittings, and specialties.

D. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial, gas-fired, storage, domestic-water heaters.

END OF SECTION 22 34 00

SECTION 22 42 13 13

COMMERCIAL WATER CLOSETS

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. Water closets.

2. Flushometer valves.

3. Toilet seats.

1.3 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

8. Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply with CBC Section 11B-213.2 shall comply with CBC Section 11B-213.3.

9. Access plumbing fixtures shall comply with all of the requirements of CBC Division 6.

10. Clearance around accessible water closets and in toilet compartments shall be 60 inches minimum measured perpendicular from the side wall and 56 inches minimum measured perpendicular from the rear wall per CBC Section 11B-604.3.1.

11. Heights and location of all fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.

12. Accessible fixture controls shall comply with CBC Sections 11B-604.6 for water closets and 11B-604.9.5 for children's water closets.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.6 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.7 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.8 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.9 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.10 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.11 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than six of each type.

1.12 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.13 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.14 GUARANTEES (Also see General Conditions)

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 Equipment and Fixtures:

A. Fixtures:

1. See schedule on drawings.

2.2 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

A. Water Closets: Floor mounted, bottom outlet, top spud.

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

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. American Standard America.

b. Kohler Co.

3. Bowl:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.

b. Material: Vitreous china.

c. Type: Siphon jet.

d. Style: Flushometer valve.

e. Height: Standard.

f. Rim Contour: Elongated.

g. Water Consumption: 1.28 gal. (4.8 L) per flush.

h. Spud Size and Location: NPS 1-1/2 (DN 40); top.

2.3 FLUSHOMETER VALVES

A. Lever-Handle, Diaphragm Flushometer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Sloan Valve Company.

3. Standard: ASSE 1037.

4. Minimum Pressure Rating: 125 psig (860 kPa).

5. Features: Include integral check stop and backflow-prevention device.

6. Material: Brass body with corrosion-resistant components.

7. Exposed Flushometer-Valve Finish: Chrome plated.

8. Panel Finish: Chrome plated or stainless steel.

9. Style: Exposed.

10. Consumption: 1.28 gal. (4.8 L) per flush.

11. Minimum Inlet: NPS 1 (DN 25).

12. Minimum Outlet: NPS 1-1/4 (DN 32).

2.4 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Bemis Manufacturing Company.

b. Olsonite Seat Co.

3. Standard: IAPMO/ANSI Z124.5.

4. Material: Plastic.

5. Type: Commercial (Standard).

6. Shape: Elongated rim, open front.

7. Hinge: Self-sustaining, check.

8. Hinge Material: Noncorroding metal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Locations and Accessibility: Install equipment for ease of maintenance and repair. If changes in the indicated locations or arrangements are made by the Contractor, they shall be made without additional charges.

B. Openings: Furnish information to the other trades on size and location of openings which are required in walls, slabs, roof, for piping and equipment at the proper times.

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

D. Closing-In of Uninspected Work: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Any work enclosed or covered prior to such inspection and test shall be uncovered and, after it has been inspected, tested, and approved, make all repairs with such materials as may be necessary to restore all work, including that of other trades, to its original and proper condition.

3.2 INSTALLATION

A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.

2. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.

2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.

3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.

C. Install toilet seats on water closets.

D. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.

2. Install deep-pattern escutcheons if required to conceal protruding fittings.

3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.

2. Match sealant color to water-closet color.

3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed water closets and fittings.

C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

3.6 PLUMBING FIXTURES

A. Accessible plumbing fixtures shall comply with all of the requirements of CBC Division 6.

B. Heights and location of all accessible fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.

C. Fixture controls shall comply with CBC Sections 11B-604.6 for water closets

END OF SECTION

SECTION 22 42 13 16

COMMERCIAL URINALS

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. Urinals.

2. Flushometer valves.

1.3 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

8. Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply with CBC Section 11B-213.2 shall comply with CBC Section 11B-213.3.

9. Access plumbing fixtures shall comply with all of the requirements of CBC Division 6.

10. Heights and location of all fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.

11. Accessible fixture controls shall comply with CBC Sections 11B-605.4 for urinals.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.6 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.7 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.8 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.9 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.10 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.11 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than six of each type.

1.12 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.13 RECORD DRAWINGS

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.14 GUARANTEES (Also see General Conditions)

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND FIXTURES:

A. Fixtures:

1. See schedule on drawings.

2.2 WALL-HUNG URINALS

A. Urinals: Floor mounted, back outlet, washout.

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

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. American Standard

b. Kohler Co.

3. Fixture:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.

b. Material: Vitreous china.

c. Type: Washout.

d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.

e. Water Consumption: Water saving.

f. Spud Size and Location: NPS 3/4 (DN 20); top.

g. Outlet Size and Location: NPS 2 (DN 50); back.

h. Color: White.

4. Waste Fitting:

a. Standard: ASME A112.18.2/CSA B125.2 for coupling.

b. Size: NPS 2 (DN 50).

5. Support: ASME A112.6.1M, Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular, steel uprights.

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) ZURN CARRIERS

2.3 URINAL FLUSHOMETER VALVES

A. Lever-Handle, Diaphragm Flushometer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Sloan Valve Company.

3. Standard: ASSE 1037.

4. Minimum Pressure Rating: 125 psig (860 kPa).

5. Features: Include integral check stop and backflow-prevention device.

6. Material: Brass body with corrosion-resistant components.

7. Exposed Flushometer-Valve Finish: Chrome plated.

8. Panel Finish: Chrome plated or stainless steel.

9. Style: Exposed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Locations and Accessibility: Install equipment for ease of maintenance and repair. If changes in the indicated locations or arrangements are made by the Contractor, they shall be made without additional charges.

B. Openings: Furnish information to the other trades on size and location of openings which are required in walls, slabs, roof, for piping and equipment at the proper times.

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

D. Closing-In of Uninspected Work: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Any work enclosed or covered prior to such inspection and test shall be uncovered and, after it has been inspected, tested, and approved, make all repairs with such materials as may be necessary to restore all work, including that of other trades, to its original and proper condition.

3.2 INSTALLATION

A. Urinal Installation:

1. Install urinals level and plumb according to roughing-in drawings.

2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.

3. Install wall-hung, bottom-outlet urinals with tubular waste piping attached to supports.

4. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

1. Install supports, affixed to building substrate, for wall-hung urinals.

2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.

3. Use carriers without waste fitting for urinals with tubular waste piping.

4. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.

C. Flushometer-Valve Installation:

1. Install flushometer-valve water-supply fitting on each supply to each urinal.

2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.

3. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.

4. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

D. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations.

2. Install deep-pattern escutcheons if required to conceal protruding fittings.

3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Joint Sealing:

1. Seal joints between urinals and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.

2. Match sealant color to urinal color.

3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to urinals, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

3.5 CLEANING AND PROTECTION

A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed urinals and fittings.

C. Do not allow use of urinals for temporary facilities unless approved in writing by Owner.

3.6 Completion of Installation:

A. Cleaning and Flushing: Clean all equipment and materials thoroughly. Leave surface to be painted smooth and clean, ready for painting.

B. Flush each unit of water supply and distribution system thoroughly with clean water at the highest velocities attainable.

C. Clean all piping, valves, traps, water heaters, fixtures and other devices thoroughly and flush or blow out until free of scale, oil silt, sand, sediment, pipe dope and foreign matter of any kind.

3.7 PLUMBING FIXTURES

A. Accessible plumbing fixtures shall comply with all of the requirements of CBC Division 6.

B. Heights and location of all accessible fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.

C. Fixture controls shall comply with CBC Sections 11B-605.4 for urinals.

END OF SECTION

SECTION 22 42 16 13

COMMERCIAL LAVATORIES

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. Lavatories.

2. Faucets.

1.3 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

8. Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply with CBC Section 11B-213.2 shall comply with CBC Section 11B-213.3.

9. Access plumbing fixtures shall comply with all of the requirements of CBC Division 6.

10. Heights and location of all fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.

11. Accessible fixture controls shall comply with CBC Sections 11B-611.3 for lavatories and sinks.

12. Accessible lavatories and sinks shall be mounted with the front of the higher of the rim or counter surface 34” maximum above the finish floor or ground. Depth of lavatories or sinks shall not interfere with knee an toe clearance provided in accordance with CBC 11B-306 when forward approach is required CBC Sections 11B-606.3 and 11B606.7.

13. Water supply and drain pipes under accessible lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under accessible lavatories or sinks. CBC Section 11B-606.5.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.6 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.7 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.8 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.9 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.10 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.11 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

1.12 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.13 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.14 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 Equipment and Fixtures:

A. Fixtures:

1. See schedule on drawings.

2.2 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory: Vitreous china, wall mounted, with back.

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

a. American Standard America.

b. Kohler Co.

2. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.

b. Type: For wall hanging.

c. Faucet-Hole Location: Top.

d. Color: White.

e. Mounting Material: Chair carrier.

3. Support: ASME A112.6.1M, Type II, concealed-arm lavatory carrier.

2.3 VITREOUS-CHINA, UNDERCOUNTER-MOUNTED LAVATORIES

A. Lavatory: Vitreous china, under-counter mounted.

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

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. American Standard America.

b. Kohler Co.

3. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.

b. Type: For deck mounted.

c. Faucet-Hole Location: Counter.

d. Color: White.

e. Mounting Material: Manufacturers recommended installation.

2.4 SOLID-BRASS, MANUALLY OPERATED FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Lavatory Faucets: Manual-type, single-control mixing, commercial, solid-brass valve.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Chicago Faucets.

3. Standard: ASME A112.18.1/CSA B125.1.

4. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.

5. Body Material: Commercial, solid brass.

6. Finish: Polished chrome plate.

7. Mounting Type: Deck, exposed.

2.5 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Chicago

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Chicago

E. Operation: Loose key.

F. Risers:

1. NPS 3/8.

2. Chrome-plated, rigid-copper-pipe and brass straight or offset tailpieces riser.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Locations and Accessibility: Install equipment for ease of maintenance and repair. If changes in the indicated locations or arrangements are made by the Contractor, they shall be made without additional charges.

B. Openings: Furnish information to the other trades on size and location of openings which are required in walls, slabs, roof, for piping and equipment at the proper times.

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

D. Closing-In of Uninspected Work: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Any work enclosed or covered prior to such inspection and test shall be uncovered and, after it has been inspected, tested, and approved, make all repairs with such materials as may be necessary to restore all work, including that of other trades, to its original and proper condition.

3.2 INSTALLATION

A. Install lavatories level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-mounted lavatories.

C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.

D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

G. Point of use mixing valve in cabinet to be recessed in wall, under lavatory.

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.

B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed lavatories and fittings.

D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

3.6 PLUMBING FIXTURES

A. Accessible plumbing fixtures shall comply with all of the requirements of CBC Division 6.

B. Heights and location of all accessible fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.

C. Fixture controls shall comply with CBC Sections 11B-606.4 for lavatories and sinks.

D. Accessible sinks shall be 6-1/2” deep maximum. Sinks shall be mounted with front of the higher of the rim and counter surface 34” maximum above the finish floor or ground.

E. Water supply and drain pipes under lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under lavatories and sinks. CBC Section 11B-606.

END OF SECTION 22 42 16 13

SECTION 22 42 16 16

COMMERCIAL SINKS

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. Classroom Sinks

2. Sinks

3. Service sinks.

4. Sink faucets.

1.3 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

8. Access plumbing fixtures shall comply with all of the requirements of CBC Division 6.

9. Heights and location of all fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.

10. Accessible fixture controls shall comply with CBC Sections 11B-611.3 for lavatories and sinks.

11. Accessible lavatories and sinks shall be mounted with the front of the higher of the rim or counter surface 34” maximum above the finish floor or ground. Depth of lavatories or sinks shall not interfere with knee an toe clearance provided in accordance with CBC 11B-306 when forward approach is required CBC Sections 11B-606.3 and 11B606.7.

12. Water supply and drain pipes under accessible lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under accessible lavatories or sinks. CBC Section 11B-606.5.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.5 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.6 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.7 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.8 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.9 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.10 SUBMITTAL DATA

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.11 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

1.12 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.13 RECORD DRAWINGS

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.14 GUARANTEES

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 Equipment and Fixtures:

A. Fixtures:

1. See schedule on drawings.

2.2 SINKS

A. Utility Sinks: Stainless steel, counter mounted.

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

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Elkay Manufacturing Co.

b. Just Manufacturing.

3. Fixture:

a. Standard: ASME A112.19.3/CSA B45.4.

b. Type: Ledge back.

c. Number of Compartments: One

d. Overall Dimensions: 22 by 19 inches

e. Metal Thickness: 0.050 inch

f. Compartment:

1) Dimensions: See Plumbing Fixture Schedule

2) Drain: Grid with NPS 1-1/2 tailpiece with stopper

3) Drain Location: Centered in compartment.

4. Faucet(s): See Plumbing Fixture Schedule

a. Number Required: One.

b. Mounting: On ledge.

2.3 VITREOUS-CHINA, WALL-MOUNTED HAND SINKS

A. Lavatory: Vitreous china, wall mounted, with back.

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

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. American Standard America.

b. Kohler Co.

3. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.

b. Type: For wall hanging.

c. Faucet-Hole Location: Top.

d. Color: White.

e. Mounting Material: Chair carrier.

4. Support: ASME A112.6.1M, Type II, concealed-arm lavatory carrier.

2.4 SERVICE SINKS

A. Service Sinks: Enameled, cast iron, floor mounted.

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

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Commercial Enameling Company (CECO).

b. American Standard America.

c. Kohler Co.

3. Fixture:

a. Standard: ASME A112.19.1/CSA B45.2.

b. Style: With front apron and raised back.

c. Nominal Size: 28 by 28 inches.

d. Color: White.

e. Drain: Grid with NPS 3 outlet.

f. Rim Guard: Coated wire.

2.5 SINK FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.

B. Sink Faucets: Manual Type, Push Button.

1. Commercial, Solid-Brass Faucets.

a. Manufacturers: Subject to compliance with requirements, provide products by 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) Chicago Faucets.

2. Standard: ASME A112.18.1/CSA B125.1.

3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.

4. Body Material: Commercial, solid brass.

5. Finish: Chrome plated.

6. Maximum Flow Rate:

a. Sinks: 1.8 gpm.

b. Service Sinks: - gpm

7. Mounting Type: Back/wall, exposed.

8. Vacuum Breaker: Required for hose outlet.

9. Spout Outlet: Hose thread according to ASME B1.20.7.

2.6 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless-steel wall flange.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Chicago

D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Chicago

E. Operation: Loose Key.

2.7 SINK WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.

C. Trap:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. McGuire MFG.

3. Size: NPS 1-1/2.

4. Material: Chrome-plated, seamless prewrapped cast-brass trap and swivel elbow, and chrome-plated brass or steel wall flange.

2.8 SERVICE SINK WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 3 offset and straight tailpiece.

C. Trap:

1. Size: NPS 3.

2. Material: Flat Chrome strainer, cast-brass trap and swivel elbow.

2.9 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Locations and Accessibility: Install equipment for ease of maintenance and repair. If changes in the indicated locations or arrangements are made by the Contractor, they shall be made without additional charges.

B. Openings: Furnish information to the other trades on size and location of openings which are required in walls, slabs, roof, for piping and equipment at the proper times.

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

D. Closing-In of Uninspected Work: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Any work enclosed or covered prior to such inspection and test shall be uncovered and, after it has been inspected, tested, and approved, make all repairs with such materials as may be necessary to restore all work, including that of other trades, to its original and proper condition.

3.2 INSTALLATION

A. Install sinks level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-hung sinks.

C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.

D. Set floor-mounted sinks in leveling bed of cement grout.

E. Install water-supply piping with stop on each supply to each sink faucet.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."

2. Install stops in locations where they can be easily reached for operation.

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 CONNECTIONS

A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of sinks, inspect and repair damaged finishes.

B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed sinks and fittings.

D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

3.6 Completion of Installation:

A. Cleaning and Flushing: Clean all equipment and materials thoroughly. Leave surface to be painted smooth and clean, ready for painting.

B. Flush each unit of water supply and distribution system thoroughly with clean water at the highest velocities attainable.

C. Clean all piping, valves, traps, water heaters, fixtures and other devices thoroughly and flush or blow out until free of scale, oil silt, sand, sediment, pipe dope and foreign matter of any kind.

3.7 PLUMBING FIXTURES

A. Accessible plumbing fixtures shall comply with all of the requirements of CBC Division 6.

B. Heights and location of all accessible fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.

C. Fixture controls shall comply with CBC Sections 11B-606.4 for lavatories and sinks.

D. Accessible sinks shall be 6-1/2” deep maximum. Sinks shall be mounted with front of the higher of the rim and counter surface 34” maximum above the finish floor or ground.

E. Water supply and drain pipes under lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under lavatories and sinks. CBC Section 11B-606.

END OF SECTION

SECTION 22 42 23

COMMERCIAL SHOWERS

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. Individual shower receptors.

2. Shower faucets.

3. Group showers.

4. Grout.

B. Related Requirements:

1. Section 224100 "Residential Plumbing Fixtures" for residential showers.

2. Section 224300 "Medical Plumbing Fixtures" for healthcare showers.

3. Section 224500 "Emergency Plumbing Fixtures" for emergency showers.

4. Section 224600 "Security Plumbing Fixtures" for security showers.

1.1 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.2 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).

2. 2022 California Plumbing Code.

3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

4. National Fire Protection Association.

5. California State Division of Industrial Safety.

6. County Health Department.

7. Any other legally constituted body-having jurisdiction thereof.

8. Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply with CBC Section 11B-213.2 shall comply with CBC Section 11B-213.3.

9. Access plumbing fixtures shall comply with all of the requirements of CBC Division 6.

10. Heights and location of all fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.

11. Accessible fixture controls shall comply with CBC Sections 11B-608.5 for showers.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.1 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.2 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.1 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.2 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his

equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.3 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.4 SUBMITTAL DATA

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for showers.

2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

B. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

C. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For shower faucets to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.

2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

1.7 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Storm-Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of storm-drainage service.

2. Do not proceed with interruption of storm-drainage service without Architect's written permission.

PART 2 - PRODUCTS

2.1 SHOWER FAUCETS

A. NSF Standard: Comply with NSF 61, "Drinking Water System Components - Health Effects," for shower materials that will be in contact with potable water.

B. Shower Faucets Faculty:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Symmons

b. Bradley

c. Acorn Engineering Company

3. Description: Single-handle, pressure-balance mixing valve with hot- and cold-water indicators; check stops; and shower head.

4. Faucet:

a. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016.

b. Body Material: Solid brass.

c. Finish: Polished chrome plate.

d. Maximum Flow Rate: 1.5 gpm.

e. Mounting: Exposed.

f. Operation: Single-handle control.

g. Antiscald Device: Integral with mixing valve.

h. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.

5. Supply Connections: NPS 1/2.

6. Shower Head:

a. Standard: ASME A112.18.1/CSA B125.1.

b. Type: Hand shower with five foot stainless steel hose.

c. Shower Head Material: Metallic with chrome-plated finish.

d. Spray Pattern: Fixed.

e. Integral Volume Control: Required.

f. Shower-Arm, Flow-Control Fitting: 1.5 gpm.

g. Temperature Indicator: Not required.

2.2 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before shower installation.

B. Examine walls and floors for suitable conditions where showers will be installed.

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

3.2 INSTALLATION

A. Assemble shower components according to manufacturers' written instructions.

B. Install showers level and plumb according to roughing-in drawings.

C. Install water-supply piping with stop on each supply to each shower faucet.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with shower. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."

2. Install stops in locations where they can be easily reached for operation.

D. Install shower flow-control fittings with specified maximum flow rates in shower arms.

E. Set shower receptors in leveling bed of cement grout.

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheons requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

G. Seal joints between showers and floors and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 COMPLETION OF INSTALLATION:

A. Cleaning and Flushing: Clean all equipment and materials thoroughly. Leave surface to be painted smooth and clean, ready for painting.

B. Flush each unit of water supply and distribution system thoroughly with clean water at the highest velocities attainable.

C. Clean all piping, valves, traps, water heaters, fixtures and other devices thoroughly and flush or blow out until free of scale, oil silt, sand, sediment, pipe dope and foreign matter of any kind.

3.4 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with traps and soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.5 ADJUSTING

A. Operate and adjust showers and controls. Replace damaged and malfunctioning showers, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.6 CLEANING AND PROTECTION

A. After completing installation of showers, inspect and repair damaged finishes.

B. Clean showers, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed fixtures and fittings.

D. Do not allow use of showers for temporary facilities unless approved in writing by Owner.

3.7 OPERATION INSTRUCTION

A. Prior to occupancy or prior to the date of final inspection, whichever may occur first, the Contractor shall prepare two (2) sets of typewritten instructions for the operation of all equipment, valves, etc., specified and furnished as a part of the work under this section, and shall assign a competent person, thoroughly familiar with the job, to demonstrate and instruct a representative of the Owner in the operation of the equipment. The time of said demonstration and instructions shall be arranged with the Owner's representative approximately one (1) week in advance. Verbal instructions shall include shut-off location of gas and water. The Contractor shall assemble all operation and maintenance data supplied by the manufacturers of the various pieces of equipment, all keys and special wrenches required to operate and service the equipment (including keys for yard boxes, gas stops and fixture stops), and all equipment warranties and deliver same to the representative of the Owner on date of said instructions.

END OF SECTION 22 42 23

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.

2. Mechanical sleeve seals.

3. Sleeves.

4. Escutcheons.

5. Grout.

6. Equipment installation requirements common to equipment sections.

7. Painting and finishing.

8. Concrete bases.

9. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.

2. PE: Polyethylene plastic.

3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.

2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Mechanical sleeve seals.

2. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."

2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.

b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:

a. Advance Products & Systems, Inc.

b. Calpico, Inc.

c. Metraflex Co.

d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

3. Pressure Plates: Plastic. Include two for each sealing element.

4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

C. One-Piece, Floor-Plate Type: Cast-iron floor plate.

2.7 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

2. Design Mix: 5000-psi, 28-day compressive strength.

3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.

c. Insulated Piping: One-piece, stamped-steel type with spring clips.

d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.

e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.

f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece cast-brass type with polished chrome-plated finish.

g. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.

h. Bare Piping in Equipment Rooms: One-piece, cast-brass type.

i. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than NPS 6.

b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.

c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.

2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.

3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

T. Verify final equipment locations for roughing-in.

U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.

4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.

2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.

3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

5. Install anchor bolts to elevations required for proper attachment to supported equipment.

6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.8 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.9 GROUTING

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION

SECTION 23 05 16

EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Expansion-compensator packless expansion joints.

2. Flexible-hose packless expansion joints.

3. Grooved-joint expansion joints.

4. Pipe loops and swing connections.

5. Alignment guides and anchors.

1.3 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

1.4 ACTION SUBMITTALS

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

B. Delegated-Design Submittal: For each anchor and alignment guide indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.

2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.

3. Alignment Guide Details: Detail field assembly and attachment to building structure.

4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of expansion joint, from manufacturer.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For expansion joints to include in maintenance manuals.

1.7 QUALITY ASSURANCE

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

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

2. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 PACKLESS EXPANSION JOINTS

A. Rubber, Expansion-Compensator Packless Expansion Joints:

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

a. Mason Industries, Inc.

b. Metraflex Company (The).

c. Flex-Hose Co., Inc.

2. Material: Twin reinforced-rubber spheres with external restraining cables.

3. Minimum Pressure Rating: 225 psig at 170 deg F unless otherwise indicated.

4. End Connections for NPS 2 and Smaller: Threaded.

B. Flexible-Hose Packless Expansion Joints:

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

a. Flex-Hose Co., Inc.

b. Mason Industries, Inc.

c. Metraflex Company (The).

d. Unisource Manufacturing, Inc.

2. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.

3. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.

4. Expansion Joints for Copper Tubing NPS 2 and Smaller: Copper-alloy fittings with solder-joint end connections.

a. Bronze hoses and single-braid bronze sheaths with 450 psig at 70 deg F and 340 psig at 450 deg F ratings.

5. Expansion Joints for Copper Tubing NPS 2-1/2 to NPS 4: Copper-alloy fittings with solder-joint end connections.

a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 300 psig at 70 deg F and 225 psig at 450 deg F ratings.

2.2 GROOVED-JOINT EXPANSION JOINTS

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

1. Anvil International, Inc.

2. Shurjoint Piping Products.

3. Victaulic Company.

B. Description: Factory-assembled expansion joint made of several grooved-end pipe nipples, couplings, and grooved joints.

C. Standard: AWWA C606, for grooved joints.

D. Nipples: Galvanized, ASTM A 53/A 53M, Schedule 40, Type E or S, steel pipe with grooved ends.

E. Couplings: Seven, flexible type for steel-pipe dimensions. Include ferrous housing sections, EPDM gasket suitable for cold and hot water, and bolts and nuts.

2.3 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides:

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

a. Flex-Hose Co., Inc.

b. Mason Industries, Inc.

c. Metraflex Company (The).

2. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding spider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36/A 36M.

2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.

3. Washers: ASTM F 844, steel, plain, flat washers.

4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.

a. Stud: Threaded, zinc-coated carbon steel.

b. Expansion Plug: Zinc-coated steel.

c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 EXPANSION-JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Install rubber packless expansion joints according to FSA-NMEJ-702.

C. Install grooved-joint expansion joints to grooved-end steel piping

3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION

A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.

B. Connect risers and branch connections to mains with at least five pipe fittings including tee in main.

C. Connect risers and branch connections to terminal units with at least four pipe fittings including tee in riser.

D. Connect mains and branch connections to terminal units with at least four pipe fittings including tee in main.

3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install one guide on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.

C. Attach guides to pipe and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:

1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24, U-bolts bolted to anchor.

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.

1. Anchor Attachment to Steel Structural Members: Attach by welding.

2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION

SECTION 23 05 19

METERS AND GAGES FOR HVAC PIPING

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. Filled-system thermometers.

2. Thermowells.

3. Dial-type pressure gages.

4. Gage attachments.

5. Test plugs.

6. Test-plug kits.

7. Sight flow indicators.

1.3 ACTION SUBMITTALS

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

B. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 FILLED-SYSTEM THERMOMETERS

A. Direct-Mounted, Metal-Case, Vapor-Actuated Thermometers:

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

a. Ashcroft Inc.

b. Marsh Bellofram.

c. Miljoco Corporation.

d. Palmer Wahl Instrumentation Group.

e. REOTEMP Instrument Corporation.

f. Trerice, H. O. Co.

g. Weiss Instruments, Inc.

2. Standard: ASME B40.200.

3. Case: Sealed type, cast aluminum or drawn steel; 4-1/2-inch diameter.

4. Element: Bourdon tube or other type of pressure element.

5. Movement: Mechanical, with link to pressure element and connection to pointer.

6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F.

7. Pointer: Dark-colored metal.

8. Window: Glass.

9. Ring: Metal.

10. Connector Type(s): Union joint, 360 degrees in horizontal plane, with locking device; with ASME B1.1 screw threads.

11. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.

a. Design for Air-Duct Installation: With ventilated shroud.

b. Design for Thermowell Installation: Bare stem.

12. Accuracy: Plus or minus 1 percent of scale range.

2.2 DUCT-THERMOMETER MOUNTING BRACKETS

A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.3 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.

2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.

3. Material for Use with Copper Tubing: CNR.

4. Material for Use with Steel Piping: CRES.

5. Type: Stepped shank unless straight or tapered shank is indicated.

6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.

7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.

8. Bore: Diameter required to match thermometer bulb or stem.

9. Insertion Length: Length required to match thermometer bulb or stem.

10. Lagging Extension: Include on thermowells for insulated piping and tubing.

11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

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

a. AMETEK, Inc.; U.S. Gauge.

b. Ashcroft Inc.

c. Ernst Flow Industries.

d. Flo Fab Inc.

e. Marsh Bellofram.

f. Miljoco Corporation.

g. Noshok.

h. Palmer Wahl Instrumentation Group.

i. REOTEMP Instrument Corporation.

j. Tel-Tru Manufacturing Company.

k. Trerice, H. O. Co.

l. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.

m. Weiss Instruments, Inc.

n. WIKA Instrument Corporation - USA.

o. Winters Instruments - U.S.

2. Standard: ASME B40.100.

3. Case: Sealed; 4-1/2-inch nominal diameter.

4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.

5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.

6. Movement: Mechanical, with link to pressure element and connection to pointer.

7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.

8. Pointer: Dark-colored metal.

9. Window: Glass.

10. Ring: Brass.

11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS ½, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Siphons: Loop-shaped section of brass pipe with NPS 1/4 or NPS ½ pipe threads.

C. Valves: Brass ball, with NPS 1/4 or NPS ½, ASME B1.20.1 pipe threads.

2.6 TEST PLUGS

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

1. Flow Design, Inc.

2. Miljoco Corporation.

3. National Meter, Inc.

4. Peterson Equipment Co., Inc.

5. Sisco Manufacturing Company, Inc.

6. Trerice, H. O. Co.

7. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.

8. Weiss Instruments, Inc.

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

F. Core Inserts: EPDM self-sealing rubber.

2.7 TEST-PLUG KITS

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

1. Flow Design, Inc.

2. Miljoco Corporation.

3. National Meter, Inc.

4. Peterson Equipment Co., Inc.

5. Sisco Manufacturing Company, Inc.

6. Trerice, H. O. Co.

7. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.

8. Weiss Instruments, Inc.

B. Furnish one test-plug kit(s) containing two thermometers, one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

C. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F.

D. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.

E. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch- diameter dial and probe. Dial range shall be at least 0 to 200 psig.

F. Carrying Case: Metal or plastic, with formed instrument padding.

2.8 SIGHT FLOW INDICATORS

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

1. Archon Industries, Inc.

2. Dwyer Instruments, Inc.

3. Emerson Process Management; Brooks Instrument.

4. Ernst Co., John C., Inc.

5. Ernst Flow Industries.

6. KOBOLD Instruments, Inc. - USA; KOBOLD Messring GmbH.

7. OPW Engineered Systems; a Dover company.

8. Penberthy; A Brand of Tyco Valves & Controls - Prophetstown.

B. Description: Piping inline-installation device for visual verification of flow.

C. Construction: Bronze or stainless-steel body, with sight glass and ball, flapper, or paddle wheel indicator, and threaded or flanged ends.

D. Minimum Pressure Rating: 150 psig.

E. Minimum Temperature Rating: 200 deg F.

F. End Connections for NPS 2 and Smaller: Threaded.

G. End Connections for NPS 2-1/2 and Larger: Flanged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

E. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

F. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install remote-mounted pressure gages on panel.

I. Install test plugs in piping tees.

J. Install flow indicators in piping systems in accessible positions for easy viewing.

K. Assemble and install connections, tubing, and accessories between flow-measuring elements and flowmeters according to manufacturer's written instructions.

L. Install flowmeter elements in accessible positions in piping systems.

M. Install wafer-orifice flowmeter elements between pipe flanges.

N. Install differential-pressure-type flowmeter elements, with at least minimum straight lengths of pipe, upstream and downstream from element according to manufacturer's written instructions.

O. Install permanent indicators on walls or brackets in accessible and readable positions.

P. Install connection fittings in accessible locations for attachment to portable indicators.

Q. Mount thermal-energy meters on wall if accessible; if not, provide brackets to support meters.

R. Install thermometers in the following locations:

1. Inlet and outlet of each hydronic coil in air-handling units.

2. Outside-, return-, supply-, and mixed-air ducts.

S. Install pressure gages in the following locations:

1. Discharge of each pressure-reducing valve.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

B. Connect flowmeter-system elements to meters.

C. Connect flowmeter transmitters to meters.

D. Connect thermal-energy meter transmitters to meters.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at outside-, return-, supply-, and mixed-air ducts shall be the following:

1. Direct-mounted, metal-case, vapor-actuated type.

B. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Air Ducts: 0 to 100 deg F.

3.6 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each pressure-reducing valve shall be the following:

1. Sealed, direct-mounted, metal case.

B. Pressure gages at inlet and outlet of each chiller chilled-water and condenser-water connection shall be the following:

1. Sealed, direct-mounted, metal case.

C. Pressure gages at suction and discharge of each pump shall be the following:

1. Sealed, direct-mounted, metal case.

END OF SECTION

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.

2. Trapeze pipe hangers.

3. Metal framing systems.

4. Thermal-hanger shield inserts.

5. Fastener systems.

6. Pipe stands.

7. Equipment supports.

B. Related Sections:

1. Section 230516 "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.

2. Section 230548 "Vibration and Seismic Controls for HVAC for vibration isolation devices.

3. Section 233113 "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

3. Design seismic-restraint hangers and supports for piping and equipment.

1.5 ACTION SUBMITTALS

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

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.

2. Metal framing systems.

3. Fiberglass strut systems.

4. Pipe stands.

5. Equipment supports.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.

2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.

3. Nonmetallic Coatings: Plastic coating, jacket, or liner.

4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.

2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.

2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

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

a. Allied Tube & Conduit.

b. Cooper B-Line, Inc.

c. Flex-Strut Inc.

d. GS Metals Corp.

e. Thomas & Betts Corporation.

f. Unistrut Corporation; Tyco International, Ltd.

2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.

3. Standard: MFMA-4.

4. Channels: Continuous slotted steel channel with inturned lips.

5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.

6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

7. Metallic Coating: Electroplated zinc.

B. Non-MFMA Manufacturer Metal Framing Systems:

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

a. Allied Tube & Conduit.

b. Cooper B-Line, Inc.

c. Flex-Strut Inc.

d. GS Metals Corp.

e. Thomas & Betts Corporation.

f. Unistrut Corporation; Tyco International, Ltd.

2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.

3. Standard: Comply with MFMA-4.

4. Channels: Continuous slotted steel channel with inturned lips.

5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.

6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

7. Coating: Zinc.

2.4 THERMAL-HANGER SHIELD INSERTS

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

1. Carpenter & Paterson, Inc.

2. Clement Support Services.

3. ERICO International Corporation.

4. National Pipe Hanger Corporation.

5. PHS Industries, Inc.

6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.

7. Piping Technology & Products, Inc.

8. Rilco Manufacturing Co., Inc.

9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength.

C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, **zinc-coated** steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

2. Base: Plastic.

3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.

4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

2. Bases: One or more; plastic.

3. Vertical Members: Two or more protective-coated-steel channels.

4. Horizontal Member: Protective-coated-steel channel.

5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.

2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.

2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled fiberglass struts.

E. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

F. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

G. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

H. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, **NPS 2-1/2** and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

M. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

O. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

    b. NPS 4: 12 inches long and 0.06 inch thick.

    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.

    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.

    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.

6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and 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. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal framing systems and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.

2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.

3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.

4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.

5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.

6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.

7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.

8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.

9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.

10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.

11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.

12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.

13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.

15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.

16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.

17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.

18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.

19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.

21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.

2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.

4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.

3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.

4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.

6. C-Clamps (MSS Type 23): For structural shapes.

7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.

8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.

10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.

11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.

    b. Medium (MSS Type 32): 1500 lb.

    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.

2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.

3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.

4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.

5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.

6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.

8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.

    b. Vertical (MSS Type 55): Mounted vertically.

    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

R. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 23 05 29

SECTION 23 05 48

VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.

2. Restrained-spring isolators.

3. Elastomeric hangers.

4. Spring hangers.

5. Snubbers.

6. Restraint channel bracings.

7. Restraint cables.

8. Seismic-restraint accessories.

9. Mechanical anchor bolts.

10. Adhesive anchor bolts.

1.3 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning & Development (for the State of California).

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.

2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component required.

a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction.

b. Annotate to indicate application of each product submitted and compliance with requirements.

3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of vibration isolation device installation and seismic bracing for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.

B. Qualification Data: For professional engineer and testing agency.

C. Welding certificates.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

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

a. Ace Mountings Co., Inc.

b. California Dynamics Corporation.

c. Isolation Technology, Inc.

d. Kinetics Noise Control, Inc.

e. Mason Industries, Inc.

f. Vibration Eliminator Co., Inc.

g. Vibration Isolation.

h. Vibration Mountings & Controls, Inc.

2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.

3. Size: Factory or field cut to match requirements of supported equipment.

4. Pad Material: Oil and water resistant with elastomeric properties.

5. Surface Pattern: Smooth pattern.

6. Infused nonwoven cotton or synthetic fibers.

2.2 RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint:

1. Manufacturers: Subject to compliance with requirements, products by one of the following:

a. Ace Mountings Co., Inc.

b. California Dynamics Corporation.

c. Isolation Technology, Inc.

d. Kinetics Noise Control, Inc.

e. Mason Industries, Inc.

f. Vibration Eliminator Co., Inc.

g. Vibration Isolation.

h. Vibration Mountings & Controls, Inc.

2. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.

a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.

b. Top plate with threaded mounting holes.

c. Internal leveling bolt that acts as blocking during installation.

3. Restraint: Limit stop as required for equipment and authorities having jurisdiction.

4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

5. Minimum Additional Travel: 50 percent of the required deflection at rated load.

6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.3 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:

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

a. Ace Mountings Co., Inc.

b. California Dynamics Corporation.

c. Isolation Technology, Inc.

d. Kinetics Noise Control, Inc.

e. Mason Industries, Inc.

f. Vibration Eliminator Co., Inc.

g. Vibration Mountings & Controls, Inc.

2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.

3. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.4 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:

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

a. Ace Mountings Co., Inc.

b. California Dynamics Corporation.

c. Kinetics Noise Control, Inc.

d. Mason Industries, Inc.

e. Vibration Eliminator Co., Inc.

f. Vibration Isolation.

g. Vibration Mountings & Controls, Inc.

2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.

3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

4. Minimum Additional Travel: 50 percent of the required deflection at rated load.

5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

7. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.

8. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.

9. Self-centering hanger-rod cap to ensure concentricity between hanger rod and support spring coil.

2.5 SNUBBERS

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

1. Kinetics Noise Control, Inc.

2. Mason Industries, Inc.

3. Vibration Mountings & Controls, Inc.

B. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.

2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.

3. Maximum 1/4-inch air gap, and minimum 1/4-inch- thick resilient cushion.

2.6 RESTRAINT CHANNEL BRACINGS

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

1. Cooper B-Line, Inc.

2. Hilti, Inc.

3. Mason Industries, Inc.

4. Unistrut.

B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.7 RESTRAINT CABLES

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

1. Kinetics Noise Control, Inc.

2. Loos & Co., Inc.

3. Vibration Mountings & Controls, Inc.

B. Restraint Cables: ASTM A 603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.8 SEISMIC-RESTRAINT ACCESSORIES

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

1. Cooper B-Line, Inc.

2. Kinetics Noise Control, Inc.

3. Mason Industries, Inc.

4. TOLCO.

B. Hanger-Rod Stiffener: Reinforcing steel angle clamped to hanger rod.

C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to restraint cables.

D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.9 MECHANICAL ANCHOR BOLTS

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

1. Cooper B-Line, Inc.

2. Hilti, Inc.

3. Kinetics Noise Control, Inc.

4. Mason Industries, Inc.

B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic- and wind-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

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

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

C. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

D. Equipment Restraints:

1. Install seismic snubbers on HVAC equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.

2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.

3. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction that provides required submittals for component.

E. Piping Restraints:

1. Comply with requirements in MSS SP-127.

2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.

3. Brace a change of direction longer than 12 feet.

F. Install cables so they do not bend across edges of adjacent equipment or building structure.

G. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction that provides required submittals for component.

H. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

I. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

J. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

K. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.

5. Set anchors to manufacturer's recommended torque, using a torque wrench.

6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 232113 "Hydronic Piping" for piping flexible connections.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.

2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.

3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.

4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.

5. Test to 90 percent of rated proof load of device.

6. Measure isolator restraint clearance.

7. Measure isolator deflection.

8. Verify snubber minimum clearances.

9. Test and adjust restrained-air-spring isolator controls and safeties.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.

2. Warning signs and labels.

3. Pipe labels.

4. Duct labels.

5. Stencils.

6. Valve tags.

7. Warning tags.

1.3 ACTION SUBMITTALS

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

B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

C. Valve numbering scheme.

D. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

2. Letter Color: White.

3. Background Color: Black.

4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

7. Fasteners: Stainless-steel self-tapping screws.

8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's unique equipment number.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, manufacturer, model number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

2. Lettering Size: At least 1-1/2 inches high.

2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

C. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

D. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

E. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

F. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.

2. Lettering Size: At least 1-1/2 inches high.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.

2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.

2. Fasteners: Brass grommet and wire.

3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."

4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in other sections.

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Refrigerant Piping:

a. Background Color: Orange.

b. Letter Color: Black.

3.4 DUCT LABEL INSTALLATION

A. Install plastic-laminated duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For cold-air supply ducts.

2. Yellow: For hot-air supply ducts.

3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.

4. ASME A13.1 Colors and Designs: For hazardous material exhaust.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. All Valve-Tags: 1-1/2 inches minimum, round.

2. Valve-Tag Color:

a. All Valve-Tags: Natural.

3. Letter Color:

a. All Valve-Tags: Black.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. TAB: Testing, adjusting, and balancing.

C. TAB Specialist: An entity engaged to perform TAB Work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. Certified TAB reports.

E. Sample report forms.

F. Instrument calibration reports, to include the following:

1. Instrument type and make.

2. Serial number.

3. Application.

4. Dates of use.

5. Dates of calibration.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC.

2. TAB Technician: Employee of the TAB contractor and who is certified by AABC as a TAB technician.

B. TAB Conference: Meet with Owner on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items:

a. The Contract Documents examination report.

b. The TAB plan.

c. Coordination and cooperation of trades and subcontractors.

d. Coordination of documentation and communication flow.

C. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.

2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard TAB contractor's forms approved by Architect.

E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

F. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

G. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.6 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 233113 "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine operating safety interlocks and controls on HVAC equipment.

K. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.

2. Automatic temperature-control systems are operational.

3. Equipment and duct access doors are securely closed.

4. Balance, smoke, and fire dampers are open.

5. Isolating and balancing valves are open and control valves are operational.

6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.

7. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111, and SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.

2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."

3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation" and Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.

b. Measure static pressure directly at the fan outlet or through the flexible connection.

c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.

d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.

5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.

6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.

7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.

3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.

2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.

2. Air Outlets and Inlets: Plus or minus 10 percent.

3.7 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

3.8 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.

2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Fan curves.

2. Manufacturers' test data.

3. Field test reports prepared by system and equipment installers.

4. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.

2. Name and address of the TAB contractor.

3. Project name.

4. Project location.

5. Architect's name and address.

6. Engineer's name and address.

7. Contractor's name and address.

8. Report date.

9. Signature of TAB supervisor who certifies the report.

10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.

11. Summary of contents including the following:

    a. Indicated versus final performance.

    b. Notable characteristics of systems.

    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.

13. Data for terminal units, including manufacturer's name, type, size, and fittings.

14. Notes to explain why certain final data in the body of reports vary from indicated values.

15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.

    b. Conditions of filters.

    c. Cooling coil, wet- and dry-bulb conditions.

    d. Face and bypass damper settings at coils.

    e. Fan drive settings including settings and percentage of maximum pitch diameter.

    f. Inlet vane settings for variable-air-volume systems.

    g. Settings for supply-air, static-pressure controller.

    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.

2. Water and steam flow rates.

3. Duct, outlet, and inlet sizes.

4. Pipe and valve sizes and locations.

5. Terminal units.

6. Balancing stations.

7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

a. Unit identification.

b. Location.

c. Make and type.

d. Model number and unit size.

e. Manufacturer's serial number.

f. Unit arrangement and class.

g. Discharge arrangement.

h. Sheave make, size in inches, and bore.

i. Center-to-center dimensions of sheave, and amount of adjustments in inches.

j. Number, make, and size of belts.

k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.

b. Horsepower and rpm.

c. Volts, phase, and hertz.

d. Full-load amperage and service factor.

e. Sheave make, size in inches, and bore.

f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.

b. Total system static pressure in inches wg.

c. Fan rpm.

d. Discharge static pressure in inches wg.

e. Filter static-pressure differential in inches wg.

f. Preheat-coil static-pressure differential in inches wg.

g. Cooling-coil static-pressure differential in inches wg.

h. Heating-coil static-pressure differential in inches wg.

i. Outdoor airflow in cfm.

j. Return airflow in cfm.

k. Outdoor-air damper position.

l. Return-air damper position.

m. Vortex damper position.

F. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.

b. Location.

c. Make and type.

d. Model number and size.

e. Manufacturer's serial number.

f. Arrangement and class.

g. Sheave make, size in inches, and bore.

h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.

b. Horsepower and rpm.

c. Volts, phase, and hertz.

d. Full-load amperage and service factor.

e. Sheave make, size in inches, and bore.

f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.

b. Total system static pressure in inches wg.

c. Fan rpm.

d. Discharge static pressure in inches wg.

e. Suction static pressure in inches wg.

G. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.

b. Location and zone.

c. Traverse air temperature in deg F.

d. Duct static pressure in inches wg.

e. Duct size in inches.

f. Duct area in sq. ft..

g. Indicated air flow rate in cfm.

h. Indicated velocity in fpm.

i. Actual air flow rate in cfm.

j. Actual average velocity in fpm.

k. Barometric pressure in psig.

H. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.

b. Serial number.

c. Application.

d. Dates of use.

e. Dates of calibration.

3.9 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.

2. Check the following for each system:

   a. Measure airflow of at least 10 percent of air outlets.

   b. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.

   c. Verify that balancing devices are marked with final balance position.

   d. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.

2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Owner.

3. Owner shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.

2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.10 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

SECTION 23 07 13

DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.

2. Indoor, exposed supply and outdoor air.

3. Indoor, concealed return located in unconditioned space.

4. Indoor, exposed return located in unconditioned space.

5. Indoor, exposed exhaust between isolation damper and penetration of building exterior.

6. Outdoor, concealed supply and return.

7. Outdoor, exposed supply and return.

B. Related Sections:

1. Section 230719 "HVAC Piping Insulation."

2. Section 233113 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

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

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.

2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.

3. Detail application of field-applied jackets.

4. Detail application at linkages of control devices.

C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Sheet Form Insulation Materials: 12 inches square.

2. Sheet Jacket Materials: 12 inches square.

3. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; SoftTouch Duct Wrap.

b. Johns Manville; Microlite.

c. Knauf Insulation; Friendly Feel Duct Wrap.

d. Owens Corning; SOFTR All-Service Duct Wrap.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; Commercial Board.

b. Fibrex Insulations Inc.; FBX.

c. Johns Manville; 800 Series Spin-Glas.

d. Knauf Insulation; Insulation Board.

e. Manson Insulation Inc.; AK Board.

f. Owens Corning; Fiberglas 700 Series.

H. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied [FSK jacket] complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; CrimpWrap.

b. Johns Manville; MicroFlex.

c. Knauf Insulation; Pipe and Tank Insulation.

d. Manson Insulation Inc.; AK Flex.

e. Owens Corning; Fiberglas Pipe and Tank Insulation.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.Eagle Bridges - Marathon Industries; 225.

b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.

b. Eagle Bridges - Marathon Industries; 225.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.

b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.

3. Service Temperature Range: Minus 20 to plus 180 deg F.

4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.

5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.

b. Eagle Bridges - Marathon Industries; 550.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.

d. Mon-Eco Industries, Inc.; 55-50.

e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.

3. Service Temperature Range: Minus 20 to plus 180 deg F.

4. Solids Content: 60 percent by volume and 66 percent by weight.

5. Color: White.

2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.

b. Vimasco Corporation; 713 and 714.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.

4. Service Temperature Range: 0 to plus 180 deg F.

5. Color: White.

2.5 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.Eagle Bridges - Marathon Industries; 405.

b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.

c. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.

3. Fire- and water-resistant, flexible, elastomeric sealant.

4. Service Temperature Range: Minus 40 to plus 250 deg F.

5. Color: Aluminum.

6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

2.8 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 491 AWF FSK.

b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.

c. Compac Corporation; 110 and 111.

d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.

3. Thickness: 6.5 mils.

4. Adhesion: 90 ounces force/inch in width.

5. Elongation: 2 percent.

6. Tensile Strength: 40 lbf/inch in width.

7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.9 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide one of the following:

a. ITW Insulation Systems; Gerrard Strapping and Seals.

b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015-inch-thick, 1/2 inch wide with wing seal or closed seal.

3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; CHP-1.

2) GEMCO; Cupped Head Weld Pin.

3) Midwest Fasteners, Inc.; Cupped Head.

4) Nelson Stud Welding; CHP.

2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; RC-150.

2) GEMCO; R-150.

3) Midwest Fasteners, Inc.; WA-150.

4) Nelson Stud Welding; Speed Clips.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

3. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

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

1) GEMCO.

2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

D. Wire: 0.062-inch soft-annealed, galvanized steel.

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

a. C & F Wire.

2.10 CORNER ANGLES

A. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.

2. Verify that surfaces to be insulated are clean and dry.

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

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.

2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.

3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.

4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.

4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Section 078413 "Penetration Firestopping"irestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.

2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.

3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.

b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.

c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

d. Do not overcompress insulation during installation.

e. Impale insulation over pins and attach speed washers.

f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.

6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.

2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.

3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.

b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.

c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

d. Do not overcompress insulation during installation.

e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.

2. Install lap or joint strips with same material as jacket.

3. Secure jacket to insulation with manufacturer's recommended adhesive.

4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.

5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

   a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each duct system defined in the "Duct Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.

2. Indoor, exposed supply and outdoor air.

3. Indoor, concealed return located in unconditioned space.

4. Indoor, exposed return located in unconditioned space.

5. Outdoor, concealed supply and return.

6. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Fibrous-glass ducts.

2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.

3. Factory-insulated flexible ducts.

4. Factory-insulated plenums and casings.

5. Flexible connectors.

6. Vibration-control devices.

7. Factory-insulated access panels and doors.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, supply-air duct and plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. Ft. nominal density.

2. Mineral-Fiber Board: 1-1/2 inches thick and 3.0-lb/cu. Ft. nominal density.

B. Concealed, return-air duct and plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. Ft. nominal density.

2. Mineral-Fiber Board: 1-1/2 inches thick and 3.0-lb/cu. Ft. nominal density.

C. Concealed, outdoor-air duct and plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. Ft. nominal density.

2. Mineral-Fiber Board: 1-1/2 inches thick and 3.0-lb/cu. Ft. nominal density.

D. Exposed, supply-air duct and plenum insulation shall be the following:

1. Internally lined per Section 233113 “Metal Ducts.”

E. Exposed, return-air duct and plenum insulation shall be the following:

1. Internally lined per Section 233113 “Metal Ducts.”

F. Exposed, outdoor-air duct and plenum insulation shall be the following:

1. Internally lined per Section 233113 “Metal Ducts.”

3.11 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

B. Outdoor, supply-air duct and plenum insulation shall be the following:

1. Internally lined per Section 233113 “Metal Ducts.”

C. Outdoor, return-air duct and plenum insulation shall be the following:

1. Internally lined per Section 233113 “Metal Ducts.”

D. Outdoor, outdoor-air duct and plenum insulation shall be the following:

1. Internally lined per Section 233113 “Metal Ducts.”

END OF SECTION

SECTION 23 07 19

HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Condensate drain piping, indoors and outdoors.

2. Refrigerant suction and hot-gas piping, indoors and outdoors.

B. Related Sections:

1. Section 230713 "Duct Insulation."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

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

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.

2. Detail attachment and covering of heat tracing inside insulation.

3. Detail insulation application at pipe expansion joints for each type of insulation.

4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.

5. Detail removable insulation at piping specialties.

6. Detail application of field-applied jackets.

7. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA, Inc.; Aerocel.

b. Armacell LLC; AP Armaflex.

c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Ramco Insulation, Inc.; Super-Stik.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA, Inc.; Aeroseal.

b. Armacell LLC; Armaflex 520 Adhesive.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.

d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.

b. Eagle Bridges - Marathon Industries; 225.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.

d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.

b. Eagle Bridges - Marathon Industries; 225.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.

d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.

b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.

3. Service Temperature Range: Minus 20 to plus 180 deg F.

4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.

5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.

b. Eagle Bridges - Marathon Industries; 550.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.

d. Mon-Eco Industries, Inc.; 55-50.

e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.

3. Service Temperature Range: Minus 20 to plus 180 deg F.

4. Solids Content: 60 percent by volume and 66 percent by weight.

5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.

b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.

c. Vimasco Corporation; 713 and 714.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.

4. Service Temperature Range: 0 to plus 180 deg F.

5. Color: White.

2.6 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

b. Eagle Bridges - Marathon Industries; 405.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.

d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.

3. Fire- and water-resistant, flexible, elastomeric sealant.

4. Service Temperature Range: Minus 40 to plus 250 deg F.

5. Color: Aluminum.

6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.

3. Fire- and water-resistant, flexible, elastomeric sealant.

4. Service Temperature Range: Minus 40 to plus 250 deg F.

5. Color: White.

6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. Metal Jacket:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.

    b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.

    c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

    a. Factory cut and rolled to size.

    b. Finish and thickness are indicated in field-applied jacket schedules.

    c. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.

    d. Factory-Fabricated Fitting Covers:

        1) Same material, finish, and thickness as jacket.

        2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.

        3) Tee covers.

        4) Flange and union covers.

        5) End caps.

        6) Beveled collars.

        7) Valve covers.

        8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ABI, Ideal Tape Division; 428 AWF ASJ.

    b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.

    c. Compac Corporation; 104 and 105.

    d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.

3. Thickness: 11.5 mils.

4. Adhesion: 90 ounces force/inch in width.

5. Elongation: 2 percent.

6. Tensile Strength: 40 lbf/inch in width.

7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 491 AWF FSK.

b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.

c. Compac Corporation; 110 and 111.

d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.

3. Thickness: 6.5 mils.

4. Adhesion: 90 ounces force/inch in width.

5. Elongation: 2 percent.

6. Tensile Strength: 40 lbf/inch in width.

7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.10 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide one of the following:

a. ITW Insulation Systems; Gerrard Strapping and Seals.

b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, galvanized steel.

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

a. C & F Wire.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.

2. Verify that surfaces to be insulated are clean and dry.

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

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.

2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.

3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at [2 inches] [4 inches] o.c.

a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.

2. Testing agency labels and stamps.

3. Nameplates and data plates.

4. Manholes.

5. Handholes.

6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.

4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.

4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.

2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.

4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.

4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.

2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.

2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3. Install insulation to flanges as specified for flange insulation application.

4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.

4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.

4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.

3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.

2. Install lap or joint strips with same material as jacket.

3. Secure jacket to insulation with manufacturer's recommended adhesive.

4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.

5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.9 FINISHES

A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.

2. Underground piping.

3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water:

1. All Pipe Sizes: Insulation shall be the following:

a. Flexible Elastomeric: 1 inch thick.

B. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:

a. Flexible Elastomeric: 1 inch thick.

3.13 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:

a. Flexible Elastomeric: 2 inches thick.

3.14 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

A. Loose-fill insulation, for belowground piping, is specified in Section 232113.13 "Underground Hydronic Piping".

3.15 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.

D. Piping, Exposed:

1. None.

3.16 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.

D. Piping, Exposed:

1. Painted Aluminum, Corrugated: 0.024 inch thick.

3.17 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION

SECTION 23 08 00

COMMISSIONING OF HVAC SYSTEMS

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. The OPR and BOD documentation are included by reference for information only.

1.2 SUMMARY

A. This section includes commissioning process requirements for HVAC&R systems, assemblies, and equipment. Commissioning will be completed to meet the requirements of 2022 California Green Building Code (“CALGreen”) and LEED™ Rating System, Version 4.

B. Related Sections:

1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

1.3 DESCRIPTION

A. Refer to Division 01 Section “General Commissioning Requirements” for the description of commissioning.

1.4 DEFINITIONS

A. Refer to Division 01 Section “General Commissioning Requirements” for definitions.

1.5 SUBMITTALS

A. Refer to Division 01 Section “General Commissioning Requirements” for CxA’s role.

B. Refer to Division 01 Section “Submittals” for specific requirements.

C. In addition, provide the following:

1. Certificates of readiness

2. Certificates of completion of installation, prestart, and startup activities.

3. O&M manuals

4. Test reports

D. Control Drawings Submittal

1. The control drawings shall have a key to all abbreviations.

2. The control drawings shall contain graphic schematic depictions of the systems and each component.

3. The schematics will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.

4. Provide a full points list with at least the following included for each point:

   a. Controlled system

   b. Point abbreviation

   c. Point description

   d. Display unit

   e. Control point or set point (Yes / No)

   f. Monitoring point (Yes / No)

   g. Intermediate point (Yes / No)

   h. Calculated point (Yes / No)

1.6 QUALITY ASSURANCE

A. Test Equipment Calibration Requirements: Contractors will comply with test manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.7 COORDINATION

A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to coordination during the commissioning process.

2. PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the Contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC&R system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities. A sufficient quantity of two-way radios shall be provided by each subcontractor.

B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the base bid price to the Owner and left on site, except for stand-alone data logging equipment that may be used by the CxA.

C. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed.

Proprietary test equipment (and software) shall become the property of the Owner upon completion of the commissioning process.

D. Data logging equipment and software required to test equipment will be provided by the CxA, but shall not become the property of the Owner.

E. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

3. EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

A. The Installing Contractor shall prepare Pre-Functional Checklists for all commissioned components, equipment, and systems based on the manufacturers documentation and submit to the CxA for review and approval. This documentation shall be submitted with and within the time frame as O&M literature.

B. Red-lined Drawings:

1. The contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.

2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.

3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.

4. The contracted party, as defined in the Contract Documents will create the as-built drawings.

C. Operation and Maintenance Data:

1. Contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems.

2. The CxA will review the O&M literature once for conformance to project requirements.

3. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the Contractor.

D. Demonstration and Training:

1. Contractor will provide demonstration and training as required by the specifications.

2. A complete training plan and schedule must be submitted by the contractor to the CxA four weeks (4) prior to any training.

3. A training agenda for each training session must be submitted to the CxA one (1) week prior to the training session.

4. The CxA shall be notified at least 72 hours in advance of scheduled tests so that testing may be observed by the CxA and Owner's representative. A copy of the test record shall be provided to the CxA, Owner, and Architect.

5. Engage a Factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specific equipment.

6. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, trouble shooting, servicing, and maintaining equipment.

7. Review data in O&M Manuals.

E. Systems manual requirements:

1. The Systems Manual is intended to be a usable information resource containing all of the information related to the systems, assemblies, and Commissioning Process in one place with indexes and cross references.

2. The GC shall include final approved versions of the following information for the Systems Manual:

a. As-Built System Schematics

b. Verified Record Drawings

c. Test Results (not otherwise included in Cx Record)

d. Periodic Maintenance Information for computer maintenance management system

e. Recommendations for recalibration frequency of sensors and actuators

f. A list of contractors, subcontractors, suppliers, architects, and engineers involved in the project along with their contact information

g. Training Records, Information on training provided, attendees list, and any on-going training

3. This information shall be organized and arranged by building system, such as chilled water, Water Source VRF, etc.

4. Information should be provided in an electronic version to the extent possible. Legible, scanned images are acceptable for non-electronic documentation to facilitate this deliverable.

3.2 CONTRACTOR'S RESPONSIBILITIES

A. Mechanical, Controls and TAB Contractors. The commissioning responsibilities applicable to each of the mechanical, controls and TAB contractors of Division 23 are as follows (all references apply to commissioned equipment only):

B. Perform commissioning tests at the direction of the CxA.

C. Attend construction phase controls coordination meetings.

D. Attend testing, adjusting, and balancing review and coordination meetings.

E. Participate in HVAC&R systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.

F. Provide information requested by the CxA for final commissioning documentation.

G. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or sub-contract written.

H. Prepare preliminary schedule for Mechanical system orientations and inspections, operation and maintenance manual submissions, training sessions, pipe and duct system testing, flushing and cleaning, equipment start-up, testing and balancing and task completion for owner. Distribute preliminary schedule to commissioning team members.

I. Update schedule as required throughout the construction period.

J. During the startup and initial checkout process, execute prefunctional checklists for all commissioned equipment.

K. Assist the CxA in all verification and functional performance tests.

L. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

M. Gather operation and maintenance literature on all equipment, and assemble electronically. Submit to CxA (45) days after submittal acceptance.

N. Coordinate with the CxA to provide (48) hour advance notice so that the witnessing of equipment and system start-up and testing can begin.

O. Notify the CxA a minimum of (2) weeks in advance of the time for start of the testing and balancing work. Attend the initial testing and balancing meeting for review of the official testing and balancing procedures.

P. Participate in, and schedule vendors and contractors to participate in the training sessions.

Q. Provide written notification to the GC and CxA Authority that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.

1. HVAC&R equipment including all fans, air handling units, ductwork, dampers, terminals, and all other equipment furnished under this Division.

R. The equipment supplier shall document the performance of his equipment.

S. Provide a complete set of red-lined drawings to the CxA prior to the start of Functional Performance Testing.

T. Test, Adjust and Balance Contractor

1. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.

2. Submit the site specific testing and balancing plan to the CxA and AE for review and acceptance.

3. Attend the testing and balancing review meeting scheduled by the CxA. Be prepared to discuss the procedures that shall be followed in testing, adjusting, and balancing the HVAC&R system.

4. At the completion of the testing and balancing work, and the submittal of the final testing and balancing report, notify the CxA, HVAC&R contractor and the GC.

5. Participate in verification of the testing and balancing report, which will consist of repeating measurements contained in the testing and balancing reports. Assist in diagnostic purposes when directed.

U. Provide training of the Owner's operating staff using expert qualified personnel, as specified.

V. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner, to keep warranties in force.

2. Assist in equipment testing per agreements with contractors.

3. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.

W. Refer to Division 01 Section "General Commissioning Requirements" for additional contractor responsibilities.

3.3 OWNER'S RESPONSIBILITIES

A. Refer to Division 01 Section "General Commissioning Requirements" for Owner's Responsibilities.

3.4 DESIGN PROFESSIONAL'S RESPONSIBILITIES

A. Refer to Division 01 Section "General Commissioning Requirements" for Design Professional's Responsibilities.

3.5 CxA'S RESPONSIBILITIES

A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's Responsibilities.

3.6 TESTING PREPARATION

A. Certify in writing to the CxA that HVAC&R systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify in writing to the CxA that HVAC&R instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Certify in writing that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.7 TESTING, ADJUSTING AND BALANCING VERIFICATION

A. Prior to performance of Testing, Adjusting and Balancing work, provide copies of reports, sample forms, checklists, and certificates to the CxA.

B. Notify the CxA at least ten (10) days in advance of testing and balancing Work, and provide access for the CxA to witness testing and balancing Work.

C. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC&R systems at the direction of the CxA.

1. The CxA will notify testing and balancing subcontractor ten (10) days in advance of the date of field verification. Notice will not include data points to be verified.

2. The testing and balancing subcontractor shall use the same instruments (by model and serial number) that were used when original data were collected.

3. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing, adjusting, and balancing report. For sound pressure readings, a deviation of 3 dB shall result in rejection of final testing. Variations in background noise must be considered.

4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.8 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Scope of HVAC&R testing shall include entire HVAC&R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing shall include measuring capacities and effectiveness of operational and control functions.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the HVAC&R contractor, testing and balancing Subcontractor, and HVAC&R Instrumentation and Control Subcontractor shall prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct that set points be altered when simulating conditions is not practical.

H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed because of a deficiency outside the scope of the HVAC&R system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.9 HVAC&R SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual Division 23 sections. Provide submittals, test data, inspector record, and certifications to the CxA.

B. Pipe system cleaning, flushing, hydrostatic tests, and chemical treatment: Test requirements are specified in Division 23 piping Sections. HVAC&R Contractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA. Plan shall include the following:

1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.

2. Description of equipment for flushing operations.

3. Minimum flushing water velocity.

4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.

C. Refrigeration System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of chillers, cooling towers, refrigerant compressors and condensers, heat pumps, and other refrigeration systems. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.

D. HVAC&R Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air, steam, and hydronic distribution systems; special exhaust; and other distribution systems, including HVAC&R terminal equipment and unitary equipment.

E. Vibration and Sound Tests: Provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation and seismic controls.

F. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems and sub-systems. The following equipment and systems shall be evaluated:

1. VRF Fan Coil Units

2. VRF Heat Recovery Unit

3. VRF Branch Selectors

4. Exhaust Fans

5. Mini-Split System Heat Pump

6. Air Distribution (Ductwork, Louvers, Dampers)

7. Piping systems

8. Testing, Adjusting and Balancing

9. HVAC control systems

10. Equipment Vibration & Sound Control

3.10 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT

A. Refer to Division 01 Section “General Commissioning Requirements” for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.

3.11 APPROVAL

A. Refer to Division 01 Section “General Commissioning Requirements” for approval procedures.

3.12 DEFERRED TESTING

A. Refer to Division 01 Section “General Commissioning Requirements” for requirements pertaining to deferred testing.

3.13 OPERATION AND MAINTENANCE MANUALS

A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements as stated in Division 01.

B. Refer to Division 01 Section “General Commissioning Requirements” for the AE and CxA roles in the Operation and Maintenance Manual contribution, review and approval process.

C. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.

3.14 TRAINING OF OWNER PERSONNEL

A. Refer to Division 01 Section “General Commissioning Requirements” for requirements pertaining to training.

B. Mechanical Contractor. The mechanical contractor shall have the following training responsibilities:

1. Provide the CxA with a training plan one month before the planned training.

2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of HVAC equipment including, but not limited to, all HVAC equipment (ex. pumps, heat exchangers, chillers, heat rejection equipment, air conditioning units, air handling units, fans, terminal units, controls and water treatment systems, etc.)

3. Training shall normally start with residential unit sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.

4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.

5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.

6. The controls contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

7. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.

8. Training shall include:

    a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.

    b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.

    c. Discussion of relevant health and safety issues and concerns.

    d. Discussion of warranties and guarantees.

    e. Common troubleshooting problems and solutions.

    f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.

    g. Discussion of any peculiarities of equipment installation or operation.

    h. The format and training agenda in The HVAC Commissioning Process, ASHRAE Guideline 1-2007, is recommended.

9. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.

10. The mechanical contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.

11. Training shall occur after functional testing is complete, unless approved otherwise by the Owner. Discussion.

C. TAB. The TAB contractor shall have the following training responsibilities:

1. TAB shall meet for 4 hours with facility staff after completion of TAB and instruct them on the following:

    a. Go over the final TAB report, explaining the layout and meanings of each data type.

    b. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.

    c. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.

    d. Discuss any temporary settings and steps to finalize them for any areas that are not finished.

    e. Other salient information that may be useful for facility operations, relative to TAB.

END OF DOCUMENT

SECTION 23 23 00

REFRIGERANT PIPING

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 refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.

2. Hot-Gas and Liquid Lines: 535 psig.

1.4 ACTION SUBMITTALS

A. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.7 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type L.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Brazing Filler Metals: AWS A5.8.

2.2 REFRIGERANTS

A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines for Conventional Air-Conditioning Applications: Copper, Type L, drawn-temper tubing and wrought-copper fittings with brazed joints.

B. Hot-Gas and Liquid Lines: Copper, Type L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

J. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

K. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

L. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.

2. Install horizontal suction lines with a uniform slope downward to compressor.

3. Liquid lines may be installed level.

M. When brazing, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

N. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

O. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."

P. Install sleeves for piping penetrations of walls, ceilings, and floors.

Q. Install sleeve seals for piping penetrations of concrete walls and slabs.

R. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.

2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.

2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.

3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.

4. Spring hangers to support vertical runs.

5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.

2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.

3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.

4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.

5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.

6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.

7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.

8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.

9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.

D. Support multifloor vertical runs at least at each floor.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.

2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.

3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

a. Fill system with nitrogen to the required test pressure.

b. System shall maintain test pressure at the manifold gage throughout duration of test.

c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.

d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.6 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.

2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.

3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.

4. Charge system with a new filter-dryer core in charging line.

3.7 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Verify that compressor oil level is correct.

2. Open compressor suction and discharge valves.

3. Open refrigerant valves except bypass valves that are used for other purposes.

4. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

SECTION 23 31 13

METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.

2. Single-wall round ducts and fittings.

3. Sheet metal materials.

4. Duct liner.

5. Sealants and gaskets.

6. Hangers and supports.

7. Seismic-restraint devices.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.

2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.

B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.

2. Sealants and gaskets.

3. Seismic-restraint devices.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.

2. Factory- and shop-fabricated ducts and fittings.

3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.

4. Elevation of top of ducts.

5. Dimensions of main duct runs from building grid lines.

6. Fittings.

7. Reinforcement and spacing.

8. Seam and joint construction.

9. Penetrations through fire-rated and other partitions.

10. Equipment installation based on equipment being used on Project.

11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.

12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.

2. Suspended ceiling components.

3. Structural members to which duct will be attached.

4. Size and location of initial access modules for acoustical tile.

5. Penetrations of smoke barriers and fire-rated construction.

6. Items penetrating finished ceiling including the following:

a. Lighting fixtures.

b. Air outlets and inlets.

c. Speakers.

d. Sprinklers.

e. Access panels.

f. Perimeter moldings.

B. Welding certificates.

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

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

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.

2. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

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

a. Lindab Inc.

b. McGill AirFlow LLC.

c. SEMCO Incorporated.

d. Sheet Metal Connectors, Inc.

e. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.

2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

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

a. CertainTeed Corporation; Insulation Group.

b. Johns Manville.

c. Knauf Insulation.

d. Owens Corning.

2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.

3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

   a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

   b. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.

2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.

3. Butt transverse joints without gaps, and coat joint with adhesive.

4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.

6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.

7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

   a. Fan discharges.

   b. Intervals of lined duct preceding unlined duct.

   c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

    a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.

10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.

2. Tape Width: 4 inches.

3. Sealant: Modified styrene acrylic.

4. Water resistant.

5. Mold and mildew resistant.

6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.

7. Service: Indoor and outdoor.

8. Service Temperature: Minus 40 to plus 200 deg F.

9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.

10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.

2. Solids Content: Minimum 65 percent.

3. Shore A Hardness: Minimum 20.

4. Water resistant.

5. Mold and mildew resistant.

6. VOC: Maximum 75 g/L (less water).

7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.

8. Service: Indoor or outdoor.

9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.

2. Type: S.

3. Grade: NS.

4. Class: 25.

5. Use: O.

6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.

2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.

3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2.7 SEISMIC-RESTRAINT DEVICES

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

1. Cooper B-Line, Inc.; a division of Cooper Industries.

2. Ductmate Industries, Inc.

3. Hilti Corp.

4. Mason Industries.

5. TOLCO; a brand of NIBCO INC.

6. Unistrut Corporation; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by the Office of Statewide Health Planning and Development for the State of California.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.

D. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.

E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or Reinforcing steel angle clamped to hanger rod.

F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2. Outdoor, Supply-Air Ducts: Seal Class A.

3. Outdoor, Exhaust Ducts: Seal Class C.

4. Outdoor, Return-Air Ducts: Seal Class C.

5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.

6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.

7. Unconditioned Space, Exhaust Ducts: Seal Class C.

8. Unconditioned Space, Return-Air Ducts: Seal Class B.

9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.

10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.

11. Conditioned Space, Exhaust Ducts: Seal Class B.

12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.

2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.

4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems" and ASCE/SEI 7.

1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.

2. Brace a change of direction longer than 12 feet.

B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints on ducts that are suspended with vibration isolators.

E. Install seismic-restraint devices using methods approved by the Office of Statewide Health Planning and Development for the State of California.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.

G. Drilling for and Setting Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Set anchors to manufacturer's recommended torque, using a torque wrench.

5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.

2. Test the following systems:

a. Ducts with a Pressure Class Higher Than 3-Inch wg: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.

b. Supply, Return, Outdoor Air, Exhaust Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections totaling no less than 100 percent of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.

4. Test for leaks before applying external insulation.

5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.

6. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.

2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.9 DUCT CLEANING

A. Clean new and existing duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.

2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.

3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.

2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).

2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.

3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.

4. Coils and related components.

5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.

6. Supply-air ducts, dampers, actuators, and turning vanes.

7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.

2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.

3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.

4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.

5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.

6. Provide drainage and cleanup for wash-down procedures.

7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.10 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.11 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated.

B. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units

a. Pressure Class: Positive 2-inch wg.

b. Minimum SMACNA Seal Class: C.

c. SMACNA Leakage Class for Rectangular: 24.

d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive 2-inch wg.

b. Minimum SMACNA Seal Class: C.

c. SMACNA Leakage Class for Rectangular: 24.

d. SMACNA Leakage Class for Round and Flat Oval: 12.

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive 2-inch wg.

b. Minimum SMACNA Seal Class: C.

c. SMACNA Leakage Class for Rectangular: 24.

d. SMACNA Leakage Class for Round and Flat Oval: 12.

C. Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 2-inch wg.

b. Minimum SMACNA Seal Class: C.

c. SMACNA Leakage Class for Rectangular: 24.

d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.

b. Minimum SMACNA Seal Class: C.

c. SMACNA Leakage Class for Rectangular: 24.

d. SMACNA Leakage Class for Round and Flat Oval: 12

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 2-inch wg.

b. Minimum SMACNA Seal Class: C.

c. SMACNA Leakage Class for Rectangular: 24.

d. SMACNA Leakage Class for Round and Flat Oval: 12

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 2-inch wg.

b. Minimum SMACNA Seal Class: C.

c. SMACNA Leakage Class for Rectangular: 24.

d. SMACNA Leakage Class for Round and Flat Oval: 12

2. Ducts Connected to Air-Handling Units:

    a. Pressure Class: Positive or negative 2-inch wg.

    b. Minimum SMACNA Seal Class: C.

    c. SMACNA Leakage Class for Rectangular: 24.

    d. SMACNA Leakage Class for Round and Flat Oval: 12

3. Ducts Connected to Equipment Not Listed Above:

    a. Pressure Class: Positive or negative 2-inch wg.

    b. Minimum SMACNA Seal Class: C.

    c. SMACNA Leakage Class for Rectangular: 24.

    d. SMACNA Leakage Class for Round and Flat Oval: 12

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

    a. Pressure Class: Positive or negative 2-inch wg.

    b. Minimum SMACNA Seal Class: C.

    c. SMACNA Leakage Class for Rectangular: 24.

    d. SMACNA Leakage Class for Round and Flat Oval: 12

2. Ducts Connected to Air-Handling Units:

    a. Pressure Class: Positive or negative 2-inch wg.

    b. Minimum SMACNA Seal Class: C.

    c. SMACNA Leakage Class for Rectangular: 24.

    d. SMACNA Leakage Class for Round and Flat Oval: 12

3. Ducts Connected to Equipment Not Listed Above:

    a. Pressure Class: Positive or negative 2-inch wg.

    b. Minimum SMACNA Seal Class: C.

    c. SMACNA Leakage Class for Rectangular: 24.

    d. SMACNA Leakage Class for Round and Flat Oval: 12

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.

G. Liner:

1. Supply and Return Air Ducts and Plenums: Fibrous glass, Type I, 1-1/2 inches thick.

2. Transfer Ducts: Fibrous glass, Type I, 2 inches thick.

H. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.

2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.

2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.

3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.

2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.

3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.

b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.

c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.

2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.

3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.

4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.

c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

I. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.

b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm or Lower: 90-degree tap.

b. Velocity 1000 to 1500 fpm: Conical tap.

c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.

2. Barometric relief dampers.

3. Manual volume dampers.

4. Control dampers.

5. Combination fire and smoke dampers.

6. Flange connectors.

7. Turning vanes.

8. Remote damper operators.

9. Duct-mounted access doors.

10. Flexible connectors.

11. Flexible ducts.

12. Duct accessory hardware.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

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

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.

b. Manual volume damper installations.

c. Control-damper installations.

d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.

e. Duct security bars.

f. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

B. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.

2. Exposed-Surface Finish: Mill phosphatized.

B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and finish for exposed ducts.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

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

1. Greenheck Fan Corporation.

2. Pottorff.

3. Ruskin Company.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2500 fpm.

D. Maximum System Pressure: 2-inch wg.

E. Frame: Hat-shaped, 18-gage galvanized sheet steel, with welded corners or mechanically attached and mounting flange.

F. Blades: Multiple single-piece blades, center pivoted, maximum 6-inch width, 0.025-inch- thick, roll-formed aluminum with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Extruded vinyl, mechanically locked.

I. Blade Axles:

1. Material: Plated steel.

2. Diameter: 0.20 inch.

J. Tie Bars and Brackets: Galvanized steel.

K. Return Spring: Adjustable tension.

L. Bearings: Synthetic pivot bushings.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.

2. Counterweights and spring-assist kits for vertical airflow installations.

3. Chain pulls.

4. Screen Mounting: Front mounted in sleeve.

a. Sleeve Thickness: 20 gage minimum.

b. Sleeve Length: 6 inches minimum.

5. Screen Mounting: Rear mounted.

6. Screen Material: Galvanized steel.

7. Screen Type: Bird.

8. 90-degree stops.

2.4 BAROMETRIC RELIEF DAMPERS

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

1. Greenheck Fan Corporation.

2. Pottorff.

3. Ruskin Company.

B. Suitable for horizontal or vertical mounting.

C. Maximum Air Velocity: 2000 fpm.

D. Maximum System Pressure: 2-inch wg.

E. Frame: Hat-shaped, 16-gage, galvanized sheet steel with welded corners or mechanically attached and mounting flange.

F. Blades:

1. Multiple, 0.025-inch- thick, roll-formed alumrinum.

2. Maximum Width: 6 inches.

3. Action: Parallel.

4. Balance: Gravity.

5. Eccentrically pivoted.

G. Blade Seals: Vinyl.

H. Blade Axles: Plated steel.

I. Tie Bars and Brackets:

1. Material: Galvanized steel.

2. Rattle free with 90-degree stop.

J. Return Spring: Adjustable tension.

K. Bearings: Ball.

L. Accessories:

1. Flange on intake.

2. Adjustment device to permit setting for varying differential static pressures.

2.5 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

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

a. Nailor Industries Inc.

b. Pottorff.

c. Ruskin Company.

d. Trox USA Inc.

2. Standard leakage rating.

3. Suitable for horizontal or vertical applications.

4. Frames:

   a. Frame: Hat-shaped, 20-gage, galvanized sheet steel.

   b. Mitered and welded corners.

   c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

   a. Multiple or single blade.

   b. Parallel- or opposed-blade design.

   c. Stiffen damper blades for stability.

   d. Galvanized-steel, 0.064 inch thick.

6. Blade Axles: Plated steel.

7. Bearings:

   a. Molded synthetic.

   b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

2.6 CONTROL DAMPERS

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

   1. Greenheck Fan Corporation.

   2. Pottorff.

   3. Ruskin Company.

   4. Young Regulator Company.

B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

C. Frames:

   1. Hat shaped.

   2. 16-gage, galvanized sheet steel.

   3. Reinforced corners.

D. Blades:

1. Multiple blade with maximum blade width of 6 inches.

2. Opposed-blade design.

3. Aluminum.

4. 0.063 inch thick single skin.

5. Blade Edging: TPE.

E. Blade Axles: 1/2-inch- diameter; plated steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

F. Bearings:

1. Molded synthetic.

2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

3. Thrust bearings at each end of every blade.

2.7 COMBINATION FIRE AND SMOKE DAMPERS

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

1. Greenheck Fan Corporation.

2. Pottorff.

3. Ruskin Company.

B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Hat-shaped, 0.094-inch- thick, galvanized sheet steel, with welded or mechanically attached corners and mounting flange.

F. Heat-Responsive Device: Electric resettable device and switch package, factory installed, rated.

G. Smoke Detector: Integral, factory wired for single-point connection.

H. Blades: Roll-formed, horizontal, interlocking, 16-gage, galvanized sheet steel.

I. Leakage: Class II.

J. Rated pressure and velocity to exceed design airflow conditions.

K. Mounting Sleeve: Factory-installed, 0.039-inch-thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.

L. Master control panel for use in dynamic smoke-management systems.

M. Damper Motors: Two-position action.

N. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 230900 "Instrumentation and Control for HVAC."

3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.

4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.

5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.

6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.

7. Electrical Connection: 115 V, single phase, 60 Hz.

O. Accessories:

1. Test and reset switches, remote mounted.

2.8 FLANGE CONNECTORS

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

1. Ductmate Industries, Inc.

2. Nexus PDQ; Division of Shilco Holdings Inc.

3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.9 TURNING VANES

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

1. Ductmate Industries, Inc.

2. Duro Dyne Inc.

3. METALAIRE, Inc.

4. SEMCO Incorporated.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

E. Vane Construction: Double wall.

2.10 REMOTE DAMPER OPERATORS

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

1. Pottorff.

2. Ventfabrics, Inc.

3. Young Regulator Company.

B. Description: Cable system designed for remote manual damper adjustment.

C. Tubing: Galvanized spiral wire sheath.

D. Cable: Stainless steel.

E. Wall-Box Mounting: Recessed.

F. Wall-Box Cover-Plate Material: Steel.

2.11 DUCT-MOUNTED ACCESS DOORS

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

1. Ductmate Industries, Inc.

2. Greenheck Fan Corporation.

3. Pottorff.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:

a. Double wall, rectangular.

b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.

c. Vision panel.

d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.

e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

3. Number of Hinges and Locks:

a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.

b. Access Doors up to 18 Inches Square: Continuous and two sash locks.

c. Access Doors up to 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.

d. Access Doors Larger Than 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.

C. Pressure Relief Access Door:

1. Door and Frame Material: Galvanized sheet steel.

2. Door: Single wall or double wall with insulation fill with metal thickness applicable for duct pressure class.

3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.

4. Factory set.

5. Doors close when pressures are within set-point range.

6. Hinge: Continuous piano.

7. Latches: Cam.

8. Seal: Neoprene or foam rubber.

9. Insulation Fill: 1-inch- thick, fibrous-glass or polystyrene-foam board.

2.12 DUCT ACCESS PANEL ASSEMBLIES

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

1. Ductmate Industries, Inc.

2. Flame Gard, Inc.

3. 3M.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 11-gage carbon steel.

D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.13 FLEXIBLE CONNECTORS

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

1. Ductmate Industries, Inc.

2. Duro Dyne Inc.

3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..

2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.

3. Service Temperature: Minus 40 to plus 200 deg F.

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd..

2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.

3. Service Temperature: Minus 50 to plus 250 deg F.

G. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.

1. Minimum Weight: 16 oz./sq. yd..

2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.

3. Service Temperature: Minus 67 to plus 500 deg F.

H. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.

1. Minimum Weight: 14 oz./sq. yd..

2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.

3. Service Temperature: Minus 67 to plus 500 deg F.

I. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.

2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

3. Minimum Additional Travel: 50 percent of the required deflection at rated load.

4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.

7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.14 FLEXIBLE DUCTS

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

1. Flexmaster U.S.A., Inc.

2. McGill AirFlow LLC.

3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Insulated, Flexible Duct: UL 181, Class 1, polyethylene film supported by helically wound, galvanized-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.

2. Maximum Air Velocity: 5500 fpm.

3. Temperature Range: Minus 10 to plus 160 deg F.

4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.

C. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

2. Non-Clamp Connectors: Adhesive plus sheet metal screws.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.

2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire and smoke dampers according to UL listing.

H. Connect ducts to duct silencers rigidly.

I. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.

2. Upstream from duct filters.

3. At outdoor-air intakes and mixed-air plenums.

4. At drain pans and seals.

5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.

6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.

7. At each change in direction and at maximum 50-foot spacing.

8. Upstream from turning vanes.

9. Upstream or downstream from duct silencers.

10. Control devices requiring inspection.

11. Elsewhere as indicated.

J. Install access doors with swing against duct static pressure.

K. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.

2. Two-Hand Access: 12 by 6 inches.

3. Head and Hand Access: 18 by 10 inches.

4. Head and Shoulders Access: 21 by 14 inches.

5. Body Access: 25 by 14 inches.

6. Body plus Ladder Access: 25 by 17 inches.

L. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

M. Install flexible connectors to connect ducts to equipment.

N. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

O. Connect diffusers to ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.

P. Connect flexible ducts to metal ducts with draw bands.

Q. Install duct test holes where required for testing and balancing purposes.

R. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.

2. Inspect locations of access doors and verify that purpose of access door can be performed.

3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.

4. Inspect turning vanes for proper and secure installation.

5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION

SECTION 23 34 23

HVAC POWER VENTILATORS

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. Utility set fans.

2. Centrifugal roof ventilators.

3. Ceiling-mounted ventilators.

4. In-line centrifugal fans.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on actual project site elevations.

B. Operating Limits: Classify according to AMCA 99.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:

1. Certified fan performance curves with system operating conditions indicated.

2. Certified fan sound-power ratings.

3. Motor ratings and electrical characteristics, plus motor and electrical accessories.

4. Material thickness and finishes, including color charts.

5. Dampers, including housings, linkages, and operators.

6. Roof curbs.

7. Fan speed controllers.

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

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Roof framing and support members relative to duct penetrations.

2. Ceiling suspension assembly members.

3. Size and location of initial access modules for acoustical tile.

4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set for each belt-driven unit.

1.8 QUALITY ASSURANCE

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.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.9 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 UTILITY SET FANS

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

1. Greenheck Fan Corporation.

2. Loren Cook Company.

3. Aerovent; a division of Twin City Fan Companies, Ltd.

B. Housing: Fabricated of galvanized steel with side sheets fastened with a deep lock seam or welded to scroll sheets.

1. Housing Discharge Arrangement: Adjustable to eight standard positions.

C. Fan Wheels: Single-width, single inlet; welded to cast-iron or cast-steel hub and spun-steel inlet cone, with hub keyed to shaft.

1. Blade Materials: Steel.

2. Blade Type: Backward inclined.

D. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.

E. Shaft Bearings: Prelubricated and sealed, self-aligning, pillow-block-type ball bearings with ABMA 9, L_{50} of 200,000 hours.

1. Extend grease fitting to accessible location outside of unit.

F. Belt Drives:

1. Factory mounted, with final alignment and belt adjustment made after installation

2. Service Factor Based on Fan Motor Size: 1.5.

3. Motor Pulleys: Adjustable pitch for use with motors through **5** hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.

4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.

5. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

G. Accessories:

1. Inlet and Outlet: Flanged.

2. Companion Flanges: Rolled flanges for duct connections of same material as housing.

3. Backdraft Dampers: Gravity actuated with counterweight and interlocking aluminum blades with felt edges in steel frame installed on fan discharge.

4. Access Door: Gasketed door in scroll with latch-type handles.

5. Inlet Screens: Removable wire mesh.

6. Drain Connections: NPS 3/4 threaded coupling drain connection installed at lowest point of housing.

7. Weather Hoods: Weather resistant with stamped vents over motor and drive compartment.

2.2 CENTRIFUGAL ROOF VENTILATORS

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

1. Greenheck Fan Corporation.

2. Loren Cook Company.

3. Aerovent; a division of Twin City Fan Companies, Ltd.

B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Downblast Units: Provide spun-aluminum discharge baffle to direct discharge air downward, with rain and snow drains.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt Drives:

1. Resiliently mounted to housing.

2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.

3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.

4. Pulleys: Cast-iron, adjustable-pitch motor pulley.

5. Fan and motor isolated from exhaust airstream.

E. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted outside fan housing, factory wired through an internal aluminum conduit.

3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.

4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Built-in cant and mounting flange.

2. Overall Height: As required to maintain 12” above finish roof.

3. Sound Curb: Curb with sound-absorbing insulation.

4. Pitch Mounting: Manufacture curb for roof slope.

5. Metal Liner: Galvanized steel.

2.3 CEILING-MOUNTED VENTILATORS

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

1. Greenheck Fan Corporation.

2. Loren Cook Company.

3. Aerovent; a division of Twin City Fan Companies, Ltd.

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Plastic or painted aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.

3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.

4. Motion Sensor: Motion detector with adjustable shutoff timer.

5. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.

6. Filter: Washable aluminum to fit between fan and grille.

7. Isolation: Rubber-in-shear vibration isolators.

8. Manufacturer's standard roof jack or wall cap, and transition fittings.

2.4 IN-LINE CENTRIFUGAL FANS

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

1. Greenheck Fan Corporation.

2. Loren Cook Company.

3. Aerovent; a division of Twin City Fan Companies, Ltd.

B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing; with wheel, inlet cone, and motor on swing-out service door.

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.

3. Companion Flanges: For inlet and outlet duct connections.

4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.

5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

6. Vibration Isolators:

   a. Type: Spring hangers.

   b. Static Deflection: 1 inch.

2.5 MOTORS

A. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.6 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Equipment Mounting:

1. Install power ventilators on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in other sections.

2. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

C. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Section 077200 "Roof Accessories" for installation of roof curbs.

D. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

E. Support suspended units from structure using threaded steel rods and spring hangers having a static deflection of 1 inch. Vibration-control devices are specified in Section 230548 "Vibration and Seismic Controls for HVAC."

F. Install units with clearances for service and maintenance.

G. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.

2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.

3. Verify that cleaning and adjusting are complete.

4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.

5. Adjust belt tension.

6. Adjust damper linkages for proper damper operation.

7. Verify lubrication for bearings and other moving parts.

8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.

9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.

10. Shut unit down and reconnect automatic temperature-control operators.

11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION

SECTION 23 37 13

AIR DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Modular core, square ceiling diffusers.

2. Perforated diffusers.

B. Related Sections:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.

2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension assembly members.

2. Method of attaching hangers to building structure.

3. Size and location of initial access modules for acoustical tile.

4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

5. Duct access panels.

B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Modular Core, Square Ceiling Diffuser:

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

a. Price Industries.

b. Titus.

c. Anemostat Products; a Mestek company.

2. Devices shall be specifically designed for variable-air-volume flows.

3. Material: Steel.

4. Finish: Baked enamel, color selected by Architect.

5. Face Style: Modular Core.

6. Mounting: Surface.

7. Pattern: Adjustable.

B. Perforated Diffuser:

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

a. Price Industries.

b. Titus.

c. Anemostat Products; a Mestek company.

2. Devices shall be specifically designed for variable-air-volume flows.

3. Material: Steel.

4. Finish: Baked enamel, color selected by Architect.

5. Duct Inlet: Square.

6. Face Style: Flush.

7. Mounting: T-bar.

8. Pattern Controller: Adjustable with louvered pattern modules at inlet.

2.2 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

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

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 23 81 26

SPLIT-SYSTEM AIR-CONDITIONERS

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 split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

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

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set for each air-handling unit.

2. Gaskets: One set for each access door.

3. Fan Belts: One set for each air-handling unit fan.

1.7 QUALITY ASSURANCE

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.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."

2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: Five year(s) from date of Substantial Completion.

b. For Parts: One year from date of Substantial Completion.

c. For Labor: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Daikin.

2. LG

3. Carrier Corporation.

4. Mitsubishi Electric & Electronics USA, Inc.

5. Trane.

2.2 INDOOR UNITS (5 TONS OR LESS)

A. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.

3. Fan: Direct drive, centrifugal.

4. Fan Motors:

   a. Multitapped, multispeed with internal thermal protection and permanent lubrication.

   b. Enclosure Type: Totally enclosed, fan cooled.

   c. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.

   d. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.

   e. Mount unit-mounted disconnect switches on exterior of unit.

5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

6. Filters: Permanent, cleanable.

7. Condensate Drain Pans:

   a. Fabricated with **one** percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.

      1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.

      2) Depth: A minimum of 1 inch deep.

   b. Single-wall, galvanized-steel sheet.

   c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

      1) Minimum Connection Size: NPS 1.

   d. Pan-Top Surface Coating: Asphaltic waterproofing compound.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

   a. Compressor Type: Scroll.

   b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.

   c. Refrigerant Charge: R-410A.

d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.

3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.

4. Fan: Aluminum-propeller type, directly connected to motor.

5. Motor: Permanently lubricated, with integral thermal-overload protection.

6. Low Ambient Kit: Permits operation down to 45 deg F.

7. Mounting Base: Polyethylene.

2.4 ACCESSORIES

A. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:

1. Compressor time delay.

2. 24-hour time control of system stop and start.

3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.

4. Fan-speed selection including auto setting.

B. Automatic-reset timer to prevent rapid cycling of compressor.

C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

D. Drain Hose: For condensate.

E. Additional Monitoring:

1. Monitor constant and variable motor loads.

2. Monitor variable-frequency-drive operation.

3. Monitor cooling load.

4. Monitor air distribution static pressure and ventilation air volumes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Equipment Mounting:

1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in other sections.

2. Install ground-mounted, compressor-condenser components on polyethylene mounting base.

D. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

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

END OF SECTION

SECTION 23 81 29

VARIABLE REFRIGERANT FLOW HVAC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes multi evaporator, direct expansion, air-cooled, variable capacity, split systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

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

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set(s) for each air-handling unit.

1.7 QUALITY ASSURANCE

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.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."

2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: 10 year(s) from date of Substantial Completion.

b. For Parts: 10 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. LG

2. Carrier-Toshiba

3. Daikin

4. (or equal)

2.2 CONDENSING UNIT

A. General: The condensing unit is designed specifically for use with VRV IV series components.

1. The condensing unit shall be factory assembled in the USA and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of Daikin inverter scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, liquid receiver and suction accumulator.

High/low pressure gas line, liquid and suction lines must be individually insulated between the condensing and indoor units.

2. The condensing unit can be wired and piped with access from the left, right, rear or bottom.

3. The connection ratio of indoor units to condensing unit shall be permitted up to 200%.

4. Each condensing system shall be able to support the connection of up to 64 indoor units dependent on the model of the condensing unit.

5. The sound pressure level standard shall be that value as listed in the Daikin engineering manual for the specified models at 3 feet from the front of the unit. The condensing unit shall be capable of operating automatically at further reduced noise during night time or via an external input.

6. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.

7. The unit shall incorporate an auto-charging feature. Manual changing should be support with a minimum of 2 hours of system operation data to ensure correct operation.

8. The condensing unit shall be modular in design and should allow for side-by-side installation with minimum spacing.

9. The following safety devices shall be included on the condensing unit; high pressure sensor and switch, low pressure sensor, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.

10. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.

11. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation. Each system shall maintain continuous heating during oil return operation.

12. The condensing unit shall be capable of heating operation at -13°F wet bulb ambient temperature without additional low ambient controls or an auxiliary heat source.

13. The multiple condenser VRV systems shall continue to provide heat to the indoor units in heating operation while in the defrost mode.

B. Unit Cabinet:

1. The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.

C. Fan:

1. The condensing unit shall consist of one or more propeller type, direct-drive 350 or 750 W fan motors that have multiple speed operation via a DC (digitally commutating) inverter.

2. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and be of high external static pressure and shall be factory set as standard at 0.12 in. WG. A field setting switch to a maximum 0.32 in. WG pressure is available to accommodate field applied duct for indoor mounting of condensing units.

3. The fan shall be a vertical discharge configuration with a nominal airflow maximum range of 5,544 CFM to 24,684 CFM dependent on model specified.

4. Nominal sound pressure levels shall be as shown below.

5. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.

6. The fan motor shall be provided with a fan guard to prevent contact with moving parts.

7. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature. Operation sound level shall be selectable from 3 steps as shown below.

Operation Sound dB(A)	**Night Mode** **Sound Pressure Level dB(A)**
Step 1 max.	55
Step 2 max.	50
Step 3 max.	45

D. Condenser Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.

2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.

3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.

4. The fins are to be covered with an anti-corrosion Ulta Gold coating as standard with a salt spray test rating of 1000hr (ASTM B117 & Blister Rating:10), Acetic acid salt spray test: 500hr (ASTM G85 & Blister Rating:10)

5. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.

6. The outdoor coil shall have three-circuit heat exchanger design eliminating the need for bottom plate heater. The lower part of the coil shall be used for inverter cooling and be on or off during heating operation enhancing the defrost operation.

E. Compressor:

1. The Daikin inverter scroll compressors shall be variable speed (PVM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency) shall be controlled to eliminate deviation from target value. Non inverter-driven compressors, which may cause starting motor current to exceed the nominal motor current (RLA) and require larger wire sizing, shall not be allowed.

2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll “G-type” or “J-type”.

3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.

4. The capacity control range shall be as low as 3% to 100%.

5. The compressors' motors shall have a cooling system using discharge gas, to avoid sudden changes in temperature resulting in significant stresses on winding and bearings.

6. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.

7. Oil separators shall be standard with the equipment together with an intelligent oil management system.

8. The compressor shall be spring mounted to avoid the transmission of vibration eliminating the standard need for spring insolation.

9. In the event of compressor failure the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition.

10. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours and extending the operating life of the system. When connected to a central control system, sequential start is activated for all system on each DIII network.

F. Electrical:

1. The power supply to the condensing unit shall be 460 volts, 3 phase, 60 hertz +/- 10%.

2. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded, stranded 2 conductor cable.

3. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one condensing unit with one 2-cable wire, thus simplifying the wiring installation.

4.02 BS(4/6/8/10/12)Q_T BRANCH SELECTOR BOX FOR VRV IV HEAT RECOVERY SYSTEM

A. General: The BSQ36TVJ, BSQ60TVJ, BSQ96TVJ, BS4Q54TVJ, BS6Q54TVJ, BS8Q54TVJ, BS10Q54TVJ and BS12Q54TVJ branch selector boxes are designed specifically for use with VRV IV series heat recovery system components.

1. These selector boxes shall be factory assembled, wired, and piped.

2. These BSQ_T / BS(4/6/8/10/12)Q54T branch controllers must be run tested at the factory.

3. These selector boxes must be mounted indoors.

4. When simultaneously heating and cooling, the units in heating mode shall energize their subcooling electronic expansion valve.

B. Unit Cabinet:

1. These units shall have a galvanized steel plate casing.

2. Each cabinet shall house 3 electronic expansion valves for refrigerant control per branch.

3. The cabinet shall contain one subcooling heat exchanger per branch.

4. The unit shall have sound absorption thermal insulation material made of flame and heat resistant foamed polyethylene.

5. Nominal sound pressure levels must be measured and published on the submittals by the manufacturer. These sound levels must not exceed the values below.

Model Number	**Sound Level dB(A) Operating**	**Sound Level dB(A) Max**
BSQ36TVJ	42	32
BSQ60TVJ	43	32
BSQ96TVJ	44	34
BS4Q54TVJ	38	45
BS6Q54TVJ	39	47
BS8Q54TVJ	39	47
BS10Q54TVJ	40	48
BS12Q54TVJ	40	48

If an alternate manufacturer is selected, the mechanical contractor shall provide, at their own cost and expense, any additional material and labor to meet the published sound levels above.

C. Dimensions:

1. Each BSQ_T unit shall be no larger than 8-1/8” x 15-1/4” x 12-13/16”.

2. Each BS4Q_T shall be no larger than 11-3/4” x 14-9/16” x 18-15/16”.

3. Each BS(6/8)Q_T shall be no larger than 11-3/4” x 22-13/16” x 18-15/16”.

4. Each BS(10/12)Q_T shall be no larger than 11-3/4” x 32-5/16” x 18-15/16”.

D. Refrigerant Valves:

1. The unit shall be furnished with 3 electronic expansion valves per branch to control the direction of refrigerant flow. The use of solenoid valves for changeover and pressure equalization shall not be acceptable due to refrigerant noise.

2. The refrigerant connections must be of the braze type.

3. In multi-port units, each port shall have its own electronic expansion valves. If common expansion/solenoid valves are used, redundancy must be provided.

4. Each circuit shall have at least one (36,000 Btu/h indoor unit or smaller for the BSQ36TVJ, 54,000 Btu/h indoor unit or smaller for the BS(4/6/8/10/12)Q54TVJ, 60,000 Btu/h indoor unit or smaller for the BSQ60TVJ and 96,000 Btu/h indoor unit or smaller for the BSQ96TVJ) branch selector box.

5. Multiple indoor units may be connected to a branch selector box with the use of a REFNET™ joint provided they are within the capacity range of the branch selector.

E. Condensate Removal:

1. The unit shall not require provisions for condensate removal. A safety device or secondary drain pan shall be installed by the mechanical contractor to comply with the applicable mechanical code, if an alternate manufacturer is selected.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.

2. The unit shall be capable of operation within the limits of 187 volts to 255 volts.

3. The minimum circuit amps (MCA) shall be 0.1 and the maximum overcurrent protection amps (MOP) shall be 15.

4. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded 2 conductor cable.

2.3 VRV INDOOR UNITS

* FXMQ_M – CONCEALED CEILING DUCTED UNIT (Med. Static)

A. General: Daikin indoor unit FXMQ_M shall be a built-in ceiling concealed fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation into the ceiling cavity. It is constructed of a galvanized steel casing. It shall be available in capacities from 72,000 Btu/h to 96,000 Btu/h. Model numbers are FXMQ72MVJU and FXMQ96MVJU to be connected to outdoor unit model RXYQ / RWEYQ heat pump and REYQ / RWEYQ heat recovery model. It shall be a horizontal discharge air with horizontal return air configuration. All models feature a low height cabinet making them applicable to ceiling pockets that tend to be shallow. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with Daikin remote control BRC1E72 and BRC2A71. The indoor units sound pressure shall be 48 dB(A) at low speed measured 5 feet below the ducted unit.

B. Indoor Unit:

1. The Daikin indoor unit FXMQ_M shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an adjustable external static pressure switch.

2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.

3. Both refrigerant lines shall be insulated from the outdoor unit.

4. The indoor units shall be equipped with a return air thermistor.

5. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.

6. The voltage range will be 253 volts maximum and 187 volts minimum.

D. Unit Cabinet:

1. The cabinet shall be located into the ceiling and ducted to the supply and return openings.

2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

E. Fan:

1. The fan shall be direct-drive Sirocco type fan, statically and dynamically balanced impeller with high and low fan speeds available.

2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz, with a motor output of 0.51 HP.

3. The airflow rate shall be available in high and low settings.

4. The fan motor shall be thermally protected.

5. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings.

F. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.

2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.

3. The coil shall be a 3 row cross fin copper evaporator coil with 13 fpi design completely factory tested.

4. The refrigerant connections shall be flare connections and the condensate will be 1-5/16 inch outside diameter PVC.

5. A thermistor will be located on the liquid and gas line.

G. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.

2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).

3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

H. Control:

1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.

2. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

FXMQ_PA - CONCEALED CEILING DUCTED UNIT (Med. Static)

A. General: Daikin indoor unit FXMQ_PA shall be a built-in ceiling concealed fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, direct-drive DC (ECM) type fan with auto CFM adjustment at commissioning, for installation into the ceiling cavity. It is constructed of a galvanized steel casing. It shall be available in capacities from 7,500 Btu/h to 48,000 Btu/h. Model numbers are FXMQ07PAVJU, FXMQ09PAVJU, FXMQ12PAVJU, FXMQ15PAVJU, FXMQ18PAVJU, FXMQ24PAVJU, FXMQ30PAVJU, FXMQ36PAVJU, FXMQ48PAVJU, and FXMQ54PAVJU to be connected to outdoor unit model RXYQ / RXYMQ / RWEYQ heat pump and REYQ / RWEYQ heat recovery model. It shall be a horizontal discharge air with horizontal return air configuration. All models feature a low height cabinet making them applicable to ceiling pockets that tend to be shallow. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with Daikin remote control BRC1E72 and BRC2A71. Included as standard equipment, a condensate drain pan and drain pump kit that pumps to 18-3/8” from the drain pipe opening. The indoor units sound pressure shall range from 29 dB(A) to 43 dB(A) at low speed measured 5 feet below the ducted unit.

B. Indoor Unit:

1. The Daikin indoor unit FXMQ_PA shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall be equipment with automatically adjusting external static pressure logic that is selectable during commissioning. This adjusts the airflow based on the installed external static pressure.

2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.

3. Both refrigerant lines shall be insulated from the outdoor unit.

4. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 18-3/8” of lift from the center of the drain outlet and has a built in safety shutoff and alarm.

5. The indoor units shall be equipped with a return air thermistor.

6. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.

7. The voltage range will be 253 volts maximum and 187 volts minimum.

D. Unit Cabinet:

1. The cabinet shall be located into the ceiling and ducted to the supply and return openings.

2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

E. Fan:

1. The fan shall be direct-drive DC (ECM) type fan, statically and dynamically balanced impeller with three fan speeds available.

2. The unit shall be equipment with automatically adjusting external static pressure logic selectable during commissioning.

3. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range of 0.12 to 0.47 HP respectively.

4. The airflow rate shall be available in three settings.

5. The fan motor shall be thermally protected.

6. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings.

7. Fan motor external static pressure range for nominal airflow:

Model Number	**Fan ESP (in. WG)**
FXMQ07PAVJU	0.40 – 0.12
FXMQ09PAVJU	0.40 – 0.12
FXMQ12PAVJU	0.40 – 0.12
FXMQ15PAVJU	0.80 – 0.20
FXMQ18PAVJU	0.80 – 0.20
FXMQ24PAVJU	0.80 – 0.20
FXMQ30PAVJU	0.80 – 0.20
FXMQ36PAVJU	0.80 – 0.20
FXMQ48PAVJU	0.80 – 0.20
FXMQ54PAVJU	0.56 – 0.20

F. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.

2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.

3. The coil shall be a 3 row cross fin copper evaporator coil with 13 fpi design completely factory tested.

4. The refrigerant connections shall be flare connections and the condensate will be 1-1/4” outside diameter PVC.

5. A condensate pan shall be located under the coil.

6. A condensate pump with an 18-3/8” lift shall be located below the coil in the condensate pan with a built in safety alarm.

7. A thermistor will be located on the liquid and gas line.

G. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.

2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).

3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

H. Control:

1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.

2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.

3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

I. Optional Accessories Available:

1. MERV 13 Filter kit. Can be configured for right or left access. Filters replaceable without tools.

EXECUTION

2.4 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Equipment Mounting:

1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s).

2. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

2.5 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

C. Duct Connections: Duct installation requirements are specified in Section 233113 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply **and return** ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Section 233300 "Air Duct Accessories."

2.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

2.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

2.8 DEMONSTRATION

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

END OF SECTION

SECTION 26 00 00

GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

A. Work of this section includes everything necessary for or incidental to completing the electrical work, to provide a complete and operable electrical system, except as herein specifically excluded.

1.2 GENERAL REQUIREMENTS

A. Electrical System Characteristics: 120/208V. 3PH, 4W.

B. Guarantee: Furnish a written guarantee for a period of one-year from date of acceptance.

C. Codes and Regulations: Work done under this Section shall comply with the latest edition of the following: California Electrical Code, State of California Title 24, State Building Standards, Occupational Safety and Health Administration (OSHA) requirements, State of California Title 17 and to all local codes having jurisdiction. In the case where the codes have different levels of requirements, the most stringent rule shall apply.

D. Wherever a discrepancy in quantity or size of conduit, wire, equipment, devices, circuit breakers, etc., (all materials), arises on the Drawing and/or Specifications, the Contractor shall be responsible for providing and installing all material and services required by the strictest condition noted on Drawings and/or in Specifications to insure complete and operable systems as required by the Owner and Engineer.

E. The General and Supplementary Conditions, as well as Special Conditions apply in addition to items in the Electrical Section. Special attention is directed to the following sections:

1. Drawings and Specifications at the site.

2. Shop drawings and samples.

3. Record drawings.

4. Cutting and Patching.

5. Cleaning up.

6. Guarantee.

7. Tests.

F. Additional Work: Refer to Mechanical, Plumbing and Alerting System Contractor drawings and specifications for additional Electrical requirements.

G. Testing:

1. Scan:

a. Infrascan test of the distribution branch circuit panels shall be required.

b. Infrascan certified reports shall be submitted on completion to the Owner and Engineer.

c. Scans shall be performed by an independent testing laboratory with total connected loads in operation.

2. Megger:

a. New branch circuit - phase, neutral and ground conductors.

b. New insulated bonding conductors.

3. All circuits shall be tested for continuity and circuit integrity. Adjustments shall be made for circuits not complying with testing criteria.

4. Grounding System: Shall be tested by an independent testing laboratory to meet resistance specified in Part 3.1, D.3 of these Specifications. It shall be this Contractor's responsibility to make adjustments, as required, to upgrade non-complying systems to proper and safe operation.

5. All certified testing reports shall be submitted to the Owner at completion of project.

H. All Core Cutting, Drilling, and Patching:

1. For the installation of work under this Section, the aforementioned shall be performed under this Section of the Specifications and the Concrete section of the Specifications.

2. No holes will be allowed in any structural members without the written approval of the Structural Engineer.

3. For penetrations of concrete slabs or concrete footings, the work will be as directed in the Concrete Section of Specifications.

4. The contractor shall be responsible for patching and repairing surfaces where he is required to penetrate for work under this contract.

5. Penetrations shall be sealed to meet the rated integrity of the surface required to be patched and repaired. The patched surface shall be painted or finished to match the existing surface.

I. Verifying Drawings and Job Conditions:

1. This Contractor shall examine all Drawings and Specifications in a manner to be fully cognizant of all work required under this Section.

2. This Contractor shall visit the site and verify existing conditions. Where existing conditions differ from Drawings, adjustment shall be made and allowances included for all necessary equipment to complete all parts of the Drawings and Specifications.

J. Shop Drawings/Product Submittals:

1. Drawings shall be submitted in six (6) bound sets accompanied by Letter of Transmittal, which shall give a list of the number and dates of the drawings submitted. Drawings shall be complete in every respect and bound in sets.

2. The Drawings submitted shall be marked with the name of the project, numbered consecutively and bear the approval of the Contractor as evidence that the Drawings have been checked by the Contractor. Any Drawings submitted without this approval will be returned to the Contractor for resubmission.

3. If the shop drawings show variations from the requirements of the Contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in his letter of transmittal. If the substitution is accepted, the Contractor shall be responsible for proper adjustment which may be caused by the substitution. Complete working samples shall be submitted with all requests for substitution.

4. Shop drawings/product data shall be submitted on the following but not limited to:

    a. Lighting fixtures and drivers. Exterior lighting submittal shall include B-U-G ratings and fixture weights.

    b. Fire alarm system.

    c. Switches/Occupant sensors/Disconnect switches.

    d. Automatic lighting control system.

    e. Receptacles.

    f. Low Voltage / Communication system.

    g. Low Voltage / Signal and alarm systems.

    h. Audio Visual system.

    i. Fuses.

    j. Pull boxes.

    k. Emergency generator and transfer switch.

    l. Terminal Cabinets.

    m. Conduit and fittings.

    n. Wire/conductors.

    o. Conduit/Cable/Cable Tray supports.

    p. Cable Tray and fittings.

    q. Outlet boxes/Flush floor boxes.

    r. Solar PV system.

    s. End user meter and CTs.

5. Shop drawings shall include scaled site plans and floor plans indicating the location of all equipment, devices, interconnecting wire/cable, wiring diagrams, rack/enclosure elevations indicating the location of all rack mounted equipment, and sequence of operation.

6. Shop drawings shall include copies of the contractor’s current C-10 license. For low voltage systems the submittal shall include copies of the contractor’s current C-7 license, and copies of certificates identifying the low voltage contractor as a licensed distributor/installer of the equipment included in the submittal.

7. Refer to Division 27 and 28 for additional requirements.

K. Drawings of Record: The Contractor shall provide and keep up-to-date, a complete record set of blueprints. These shall be corrected daily and show every change from the original Drawings. This set of prints shall be kept on the job site and shall be used only as a record set. This shall not be construed as authorization for the Contractor to make changes in the layout without definite instruction in each case. Upon completion of the work, a set of reproducible Contract Drawings shall be obtained from the General Contractor and all changes as noted on the record set of prints shall be incorporated thereon with black ink in a neat, legible, understandable and professional manner. Refer to the Supplementary General Conditions for complete requirements.

1.3 WORK IN COOPERATION WITH OTHER TRADES

A. Examine the Drawings and Specifications and determine the work to be performed by the site utilities contractor, mechanical and plumbing contractor, solar PV system contractor, Alerting system contractor, and other trades. Provide the type and amount of electrical materials and equipment necessary to place this work in proper operation, completely wired, tested and ready for use. This shall include all conduit, wire, disconnects, relays, and other devices for the required operation of all systems or equipment whether shown on plan or not.

B. Provide power and control circuits, conduit and wire as indicated on the Mechanical, Plumbing, solar PV, and Alerting system drawings as required for complete and operable systems.

C. The electrical contractor shall be responsible for providing and installing specialty back-boxes for all communication/signal systems. The electrical contractor shall patch, repair and refinish walls, ceilings or floors disturbed by the installation of the subject back boxes.

1.4 TESTING AND ADJUSTMENT

A. Upon completion of all electrical work, this Contractor shall test all circuits, switches, motors, breakers, motor starter(s) and their auxiliary circuits and any other electrical items to insure perfect operation of all electrical equipment.

B. Equipment and parts in need of correction and discovered during such testing shall be immediately repaired or replaced with all new equipment and that part of the system shall then be retested. All such replacement or repair shall be done at no additional cost to the Owner.

C. All circuit shall be tested for continuity and circuit integrity. Adjustments shall be made for circuits not complying with testing criteria.

D. All certified testing reports shall be submitted to the Engineer at completion of project.

1.5 IDENTIFICATION

A. Identification nameplates shall be Micarta 1/8" thick and of approved size, with bevelled edges and engraved white letters 1/4" high minimum on black background. Nameplates shall be provided for all circuits in the distribution switchboards, and selector switches. Inscriptions on equipment shall be identical to those indicated in panels and/or motor control centers and other similar devices. Each nameplate shall be provided with drillings and suitable mounting screws corresponding to finish of the nameplate. The inscriptions in each nameplate shall be as indicated on the Drawings.

B. Identification of Air Conditioning Equipment: Equipment to be so identified shall include, but shall not be limited to: Pressure and temperature controllers; switches; equipment motors and boxes or cans housing other control items. Mechanical equipment nameplates shall have letters a minimum of 3/8" high.

C. Identification of Signal/Communication Outlet Wall Plates: Outlet wall plates shall be engraved on the backside with its related signal/communication system and its serving conduit origin point.

1.6 MAINTENANCE, SERVICING, INSTRUCTION MANUALS AND WIRING DIAGRAMS

A. Prior to final acceptance of the job, the Electrical Contractor shall furnish to the Owner at least four (4) copies of operating and maintenance and servicing instructions, as well as four (4) complete wiring diagrams for the following item(s) or equipment:

1. Communications system.
2. Signal/alarm system.
3. Audio-Video (A/V) system.
4. Fire alarm system.
5. Panelboards.
6. Switchboards.
7. Circuit breakers.
8. Disconnect switches.
9. Emergency generator and transfer switch.
10. LED drivers.
11. Lighting control system.
12. Occupant sensors, power packs, relay packs.
13. Solar PV system components.
14. End user meter and components.

B. All wiring diagrams shall specifically cover the system supplied. Typical drawings will not be accepted. Two (2) copies shall be presented to the Electrical Engineer and four (4) copies to the Owner.

1.7 ELECTRICAL CONTRACTOR'S RESPONSIBILITY

A. It shall be the Electrical Contractor's responsibility to obtain a complete set of Drawings and Specifications. He shall check the Drawings of the other trades and shall carefully read the entire Specifications and determine his responsibilities.

B. Contractor shall carry a valid State of California contractor’s license.

1.8 FINAL INSPECTION AND ACCEPTANCE

A. After all requirements of the Specifications and/or the Drawings have been fully completed, representatives of the Owner will inspect the work. Contractor shall provide competent personnel to demonstrate the operation of any item or system to the full satisfaction of each representative.

B. Final acceptance of the work will be made by the Owner after receipt of approval and recommendation of acceptance from each representative.

1.9

RECORD DRAWINGS

A. Contractor shall furnish one set of reproducible record drawings before final payment of retention.

1.10 SUBSTITUTIONS

A. Substitution to specified equipment shall be submitted and received by the Engineer fifteen (15) days after the bid date for review and approval.

B. To receive consideration, requests for substitutions must be accompanied by documentary proof of its equality with the specified material. Documentary proof shall be in letter form and identify the specified values/materials alongside proposed equal values/materials. In addition, catalog brochures and samples must be included in the submittal.

C. In the event that authorization is given for a substitute equal to bid, after award of contract the Contractor shall submit to the Engineer certified quotations from suppliers of both the specified and proposed equal material for price comparison and delivery dates.

D. In the event of cost reduction, the Owner will be credited with 100 percent of the reduction, arranged by Change Order.

E. The Contractor warrants that substitutions proposed for specified items will fully perform the functions required.

F. Substitutions or requests for substitution shall not be accepted and rejected for failure to comply with items A-E above.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials and Equipment: All electrical materials and equipment shall be new and shall be listed by Underwriter's Laboratories and bear their label, or listed and certified by a nationally recognized testing authority where UL does not have an approval. Custom made equipment must have complete test data submitted by the manufacturer attesting to its safety. In addition, the materials and equipment shall comply with the requirements of the following:

1. American Society of Testing Materials (ASTM).

2. Insulated Cable Engineers Association (ICEA).

3. National Electrical Manufacturer's Association (NEMA).

4. National Fire Protection Association (NFPA).

5. American National Standard Institute (ANSI).

B. Lighting Fixtures:

1. Furnish, install and connect a lighting fixture at each outlet where a lighting fixture type symbol (designated on plans) is shown as being installed. Each fixture shall be complete with all required accessories including sockets, glassware, boxes, spacers, mounting devices, fire rating enclosure, chips and drivers.

2. LED Driver shall be Class 1, 120-277V, 50/60HZ (constant current) with surge protection in accordance with IEEE/ANSI C62.41.2 guidelines with a surge current rating of 10,000 amps. Operating temperature for interior fixtures shall range from 0°C to 35°C (32°F to 95°F). Operating temperature for exterior fixtures shall range from -40°C to 40°C (-40°F to 104°F). All defective drivers shall be replaced at no cost to the Owner.

3. LED chips shall be as manufactured by CREE, Philips-Lumileds, Nichia, Osram or approved equal.

4. Interior fixtures installed in individual rooms shall be provided with LED chips of the same manufacturer. Mixing of chip manufacturers will not be allowed. All fixtures in any one room must be replaced with new fixtures when the fixtures in the room display dissimilar illumination colors.

5. Exterior fixtures shall be provided with LED chips of the same manufacturer. Mixing of chip manufacturers will not be allowed. All fixtures within line of sight must be replaced with new fixtures when the fixtures in the line of sight display dissimilar illumination colors.

6. LED chips shall have 4000º Kelvin color temperature. Color temperature indicated on the Light Fixture Schedule shall supersede the 4000° color temperature. Interior fixtures shall meet IESNA LM-79-08. Exterior fixtures shall meet IESNA LM-80-08.

7. Where indicated on the Lighting Fixture Schedule, interior light fixtures shall be provided with integral occupancy sensor and/or daylight sensor. Provide two (2) programming/configuration tools for programming the integral control devices.

8. Refer to Architectural reflected ceiling plan for type of ceiling being installed in each room and provide each fixture with required mounting devices and accessories for the particular ceiling.

9. All light fixtures shall be individually supported and properly anchored to the surfaces indicated on the Architectural elevations.

10. Locations of fixtures shall be per the architectural reflected ceiling plan and shall be coordinated at time of rough-in.

11. All exterior mounted light fixtures shall comply with current city or local lighting ordinance.

12. LED drivers for interior light fixtures shall provide full range dimming. Refer to the Lighting Fixture Schedule for the type of fixture being provided and provide a fully compatible dimming driver.

C. Conduit:

1. Rigid conduit shall be full weight threaded type aluminum or steel, except where specifically required to be steel. Steel conduit shall be protected by overall zinc coating to inside and outside surfaces, applied by the hot dip, metallizing or sherardizing process.

2. Galvanized Rigid Conduit (GRC), shall be full weight threaded type aluminum or steel, except where specifically required to be steel. Steel conduit shall be protected by overall zinc coating to inside and outside surfaces, applied by the hot dip, metallizing, or sherardizing process.

3. Intermediate Metal Conduit (IMC), shall be hot-dipped galvanized in accordance with UL 1242 and meeting Federal Specification WWC-581 (latest revision).

4. Electrical Metallic Tubing (EMT), shall be zinc-coated steel with baked enamel or plastic finish on inside surfaces.

5. Flexible metal conduit shall be constructed of aluminum or hot-dipped galvanized steel strips wound spirally with interlocking edges to provide greatest flexibility with maximum strength. Interior surfaces shall be smooth and offer minimum drag to pulling in conductors. Used only as directed by the Engineer.

6. Liquid-tight conduit (Seal-Tite) shall be galvanized steel flexible conduit as above except with moisture and oil-proof jacket, pre-cut lengths and factory installed fittings. For outdoor installations and motor connection.

7. Non-Metallic Conduit:

   a. Polyvinyl chloride (PVC) rigid conduit, Schedule 40, Type II for underground installation only.

   b. Conduit and fitting shall be produced by the same manufacturer.

8. Electrical non-metallic tubing (ENT) is not permitted.

D. Fittings:

1. Conduit bodies shall be smooth inside and out, taper threaded with integral insulating bushing and of the shapes, sizes and types required to facilitate installation or removal of wires and cables from the conduit and tubing system. These fittings shall be of metal, smooth inside and out, thoroughly galvanized, and sherardized cadmium plated.

2. Metallic conduit bodies covers shall have the same finish as the fitting and shall be provided for the opening of each fitting where conductor do not pass through the cover.

3. Connector, coupling, locknut, bushings and caps used with rigid conduit shall be steel, threaded and thoroughly galvanized. Bushings shall be insulated.

4. EMT fittings, connectors and couplings, shall be steel, zinc or cadmium plated, raintight, threadless, compression or tap-on multiple point, steel locking ring type with insulated throat.

5. Flexible steel conduit connectors shall be malleable iron clamp or squeeze type or steel twist-in type with insulated throat. The finish shall be zinc or cadmium plating.

6. Die cast, set screw or indenter type fittings are not acceptable.

7. Conduit unions shall be "Erickson" couplings, or approved equal. The use of running threads will not be permitted.

E. 600 Volt Conductors - Wire and Cable:

1. All conductors shall be stranded copper. Simpull, Slip Wire or equal.

2. Type THHN/THWN thermoplastic, 600 volt, UL approved, dry and wet locations, for conductor sizes up to and including #4 AWG.

3. Type XHHW cross-linked synthetic polymer, 600 volt, UL approved, for dry and wet locations, for conductor sizes #2 AWG. and above.

4. Cross-linked synthetic polymer, XHHW, 600 volts, UL approved, for installation underground, in concrete or masonry.

5. Wire and cable shall be new, manufactured not more than six (6) months prior to installation, shall have size, type of insulation, voltage rating and manufacturer's name permanently marked on outer covering at regular intervals.

6. Wire and cable shall be factory color coded by integral pigmentation with a separate color for each phase and neutral. Each system shall be color coded and it shall be maintained throughout.

7. Systems Conductor Color Coding:

    a. Power 208/120V, 3PH, 4W:

        (1) Phase A = Black

        (2) Phase B = Red

        (3) Phase C = Blue

        (4) Neutral = White

        (5) Switchlegs = Same as phase conductors.

        (6) Travelers = Purple with Black stripe.

    b Ground Conductors:

        (1) Green

    c Communication/Signal/Fire Alarm System:

        (1) As recommended by the manufacturer.

8. MC Luminary cable with integral 0-10V. control conductors may be used for the final connection to light fixtures (6’-0” maximum length).

9. MC cable is not permitted for interior or exterior use.

10. Non-metallic sheathed cable (Romex) is not permitted.

11. All color coding for #4 conductor and above shall be as identified above, utilizing phase tape at each termination.

12. No conductors carrying 120 volt or more shall be smaller than #12 AWG.

F. Outlet Boxes:

1. For fixtures, boxes shall be galvanized, steel, knockout type equipped with 3/8" fixture studs and plaster rings where required.

2. Unless otherwise noted on plan or specified herein, outlet boxes shall be 4” square x 2 1/8” deep, steel, knockout type, mounted flush with wall. Provide with plaster rings and wall plate.

3. For data and combination telephone/data system outlets, outlet boxes shall be 4 11/16” square x 2 1/8” deep, steel, knockout type, mounted flush with wall. Provided with plaster rings and leave outlet box ready for installation of Owner furnished wall plate.

4. For audio-visual (A/V) system, outlet boxes shall be 5” square, steel, without knockouts, mounted flush with wall. Provide with custom plaster rings and leave outlet box ready for installation of A/V contractor furnished wall plate.

5. For all other communication/signal system devices, outlet boxes shall be as recommended by the system manufacturer and provided complete with plaster rings and covers.

6. For locations where standard boxes are not suitable due to number and size of conduit to be terminated, special boxes shall be designed to fit space or meet other requirements and submitted for approval.

7. For surface mounting or exposure to wet or damp locations, outlet boxes shall be heavy cast aluminum or cast iron with threaded hubs; covers shall be watertight with gaskets and non-ferrous screws.

8. Floor boxes for on-grade applications shall be cast iron, fully adjustable type. Provide floor boxes with flange and brass covers suitable for the outlets/connectors specified on plan and in the project manual. Boxes shall be suitable for terminating the conduit specified on plan. Wiremold Omnibox series or approved equal to accommodate 1" conduit and smaller. Wiremold Resource RFB series or approved equal to accommodate conduits larger than 1".

G. Switches:

1. Standard single pole switches shall be flush tumbler, A.C. rated, quiet type, heavy duty back or side wired with binding screws, standard rocker Hubbell #1221, 20A, 120/277V, or approved equal, color as elected by Architect. Two pole three-way and other switches shall be similar. Refer to Device Plate Section of Specifications for other requirements. Switches that are part of an automatic lighting control system shall be provided with integral, factory installed, connectors to accept the system control wiring, shall be manufactured by the automatic lighting control system manufacturer, and shall be fully compatible with the lighting control system.

2. Switches located outdoors or in damp or wet locations shall be the same as above provided with steel locking weatherproof lift cover.

3. Switches controlling or disconnecting single phase motor loads in excess of 1/3HP shall be horsepower rated and approved or motor control service. Switches shall be complete with overload device of proper motor nameplate rating, where required.

4. Disconnect (safety) switches shall be fused, heavy duty type meeting NEMA Specifications. Switches shall be provided with rejection type fuse blocks. Provide switches with the number of poles, the voltage, current and horsepower ratings as required. Provide externally operable, quickmake, quick-break type mechanism with cover interlock and padlockable in either the open or closed position. Unless indicated otherwise, provide switches indoors in NEMA Type 1 enclosure and in NEMA Type 3R enclosure where indicated to be outdoors or weatherproof. Provide nameplate indicating equipment served. Provide unit as manufactured by Eaton or approved equal to match the main switchboard manufacturer.

5. Occupant sensors shall be low voltage, dual technology type, suitable for ceiling or wall mounting. Stand-alone ceiling mounted sensors shall be provided complete with relay/power pack and slave-packs to perform the switching indicated on plan. Sensors that are part of an automatic lighting control system shall be provided with integral, factory installed, connectors to accept the system control wiring. Sensors shall provide minimum 1,000 square foot coverage and provide complete coverage of the areas indicated on plan. Stand-alone sensors shall be as manufactured by Sensor Switch, Watt Stopper or Leviton. System sensors shall be as manufactured by the automatic lighting control system manufacturer and shall be fully compatible with the lighting control system.

6. Occupant sensors located in hallways/corridors shall be programmed to automatically dim the lights to 50% when the space is unoccupied. Hallway/corridor sensors shall capable of detecting motion within a 130'-0" area. Stand-alone sensors shall be provided complete with relay/power pack and slave-packs.

7. Wall mounted, switch type, combination sensor and dimmer shall be dual technology type with single or dual circuit to provide the control indicated on plan. Sensors shall provide minimum 900 square feet major motion and 400 square feet minor motion coverage. Sensor shall have a multi-function tap switch with small, raised rocker, for dimmer adjustment. Sensors shall be as manufactured by Sensor Switch or approved equal Lutron, WattStopper or Leviton. Custom color as selected by the Architect. The contractor shall ensure the dimmers are fully compatible with the LED drivers being controlled.

8. All switches, dimmers and sensors shall be listed and certified by the California Energy Commission.

9. Switches/dimmers, that are not part of an automatic lighting control system, connected to emergency circuits shall be “red” in color.

H. Automatic Lighting Controls:

1. Provide a complete and fully operable wired control system as manufactured by Acuity nLight or approved equal Lutron or Wattstopper. For proposed alternate equipment (Lutron or Wattstopper) to be considered the shop drawings must include a completely re-wired copy of the City approved lighting plan indicating the wiring, controls and connections to light fixtures required for the operation of the alternate system. The wiring and components from the specified system must be completely removed from the submitted shop drawings.

2. The wired control system shall be capable of receiving a demand response signal.

3. The lighting control system shall be provided complete with all required controllers, bridges, gateways, power supplies, occupant sensors, daylight sensors, dimmers/switches, power packs, wiring, and ancillary equipment/devices required for a fully operable system.

4. Automatic lighting control system dimmers/switches connected to emergency circuits shall be provided with wall plates with “red” engraved letters identifying the circuit being controlled.

5. The lighting control system shall be commissioned by the system’s manufacturer’s representative and programmed as required by the Owner.

6. Provide a minimum of four hours of training for personnel selected by the Owner. Training shall include a follow-up training session to be scheduled three (3) months after the initial training session is completed. All training shall be conducted at the Owner’s facility.

I. Receptacles:

1. Convenience outlet shall consist of duplex convenience receptacle mounted in an outlet box in the wall, flush with the finish surface and shall be complete with a mud ring and wall plate.

2. Receptacles for convenience outlets, unless otherwise indicated, shall be industrial heavy duty type, duplex 3W grounding type, 20A, 125V, Hubbell-Bryant #5362-*. (*) color as selected by Architect.

3. Receptacles in Dorm rooms, Captain’s Office, App Bay printer alcoves, and Dayroom shall be combination duplex, USB A and USB C charger/tamper resistant receptacle, 20A, 125V, Hubbell #USB20AC5*WR or approved equal. * = color as selected by Architect. Provide minimum one (1) USB receptacle at the workstation in offices and minimum of one (1) USB receptacle at each reclining chair in the Dayroom.

4. Receptacles in all other residential occupancies shall be industrial heavy duty type, tamper proof, 20A, 125V, Hubbell-Bryant #HBL5362*TR or approved equal, color as selected by Architect.

5. GFI receptacles shall be Hubell-Bryant #GFSG5362*, color as selected by the Architect.

6. Receptacles in indoor damp locations shall be 20A, 125V, Hubbell-Bryant #HBL5362WR or approved equal, color as selected by Architect. Provide with steel locking lift cover, Hubbell-Bryant #96067 or approved equal.

7. Weatherproof receptacle shall be industrial heavy duty type, ground fault interrupter (GFI), 20 ampere, three wire grounding type, 120 volt, with steel lockable lift cover U.L. listed for “wet” locations when in operation.

8. Receptacles located within 6’-0” of a sink or in a wet location shall be GFI type.

9. Controlled receptacles for use in offices, conference rooms, lobbies, break rooms, and where indicated on plan, shall be factory engraved as “controlled”. Hubbell #HBL5362LC1* series. Color as selected by the Architect.

10. Where a controlled receptacle is shown as part of a double duplex/quad assembly, the contractor shall provide one (1) industrial heavy duty duplex receptacle and one (1) fully controlled duplex receptacle Hubbell #HBL5362LC* series. Color as selected by the Architect.

11. Receptacles located outdoors shall be provided with steel weatherproof box and steel lockable lift cover U.L. listed for “wet” locations when in operation.

12. Specialty receptacles, identified on plans, for use with Owner furnished equipment shall be provided complete with outlet box, wall plate and receptacle to match the configuration of the plug being provided with the subject equipment. Actual receptacle configuration shall be determined at time of rough-in.

13. Contractor shall refer to the Code Analysis drawing in the Architectural contract documents for residential occupancies. Provide Receptacles as required to meet the residential requirements of the 2022 CEC.

J. Device Plates:

1. Shall be smooth thermoplastic wall plates, for the number of gang and types of openings necessary. Color shall be as selected by the Architect.

2. Plates shall be fitted, when specified for more than two gangs.

3. All switch and receptacle plates shall be engraved with related serving panel and circuit number identification on the front.

4. Plates for interior damp or wet areas, including kitchen/break rooms, shall be stainless steel, weatherproof, complete with neoprene gaskets.

5. Covers for exterior mounted receptacles shall be metallic, U.L. listed for wet locations when “in-use”.

K. Junction and Pullboxes:

1. For interior dry locations, boxes shall be galvanized one-piece drawn steel, knockout type, with removable, machine screw secured covers.

2. Minimum depth for 4” and 5” junction/pull boxes shall be 2 1/8”.

3. Minimum depth for junction/pull boxes larger than 5” shall be 4”.

4. All boxes shall be sized for the number and sizes of conductors and conduits entering the box and equipped with plaster rings where required. Each conductor shall be terminated at an insulated, barriered terminal connector and completely identified with an engraved fiber identification marker, Electrovert or Underwriter's Safety Device Company.

L. Terminal Cabinets:

1. Terminal cabinets shall be fabricated of hot dipped galvanized code gauge sheet metal for flush or surface mounting, as indicated on plan. Unless specifically noted on plans otherwise, terminal cabinets shall be no smaller than 24” high, 30” wide and 6” deep. Doors shall be hinged and lockable. Locks shall be keyed to match the branch circuit panelboards. Terminal cabinet trims shall match the branch circuit panels.

2. Provide each terminal cabinet with a full size plywood backboard and terminal blocks (minimum 25% or 12 spare terminal blocks). All wires terminating on the terminal blocks shall be identified with an engraved fiber tag.

3. Surface mounted terminal cabinets shall be installed complete with full length skirts of the same construction and finish as the terminal cabinet.

4. Where mounted outdoors, terminal cabinets shall be NEMA 3R, weatherproof complete with gaskets and required sealant to prevent moisture from entering the terminal cabinet.

M. End User Meter:

1. Provide meter in Nema 1 enclosure for monitoring of the PV feeder.

2. Provide a CT for each phase of the PV feeder. CT shall be sized per the circuit breaker rating indicated on the Single Line Diagram.

3. Provide required wiring between the CT and the meter.

4. Provide the meter with an IP output. Route Cat 6 cable from the meter to the MDF and terminate the cable at the MDF. Obtain an IP address from the City/FD IT Department.

5. Provide required software and license(s).

6. Meter shall be as manufactured by Schneider Electric, PowerLogic Power Meter 210, or approved equal.

N. Plywood Backboards:

1. Where indicated for telephone or communications system terminals or other equipment assemblies, provide backboards to cover the entire wall it is attached to (full wall height and width).

2. Use Douglas Fir Plywood, exterior grade, finished one side and painted on all surfaces with intumescent gray paint. Unless otherwise indicated, use 3/4" thick plywood.

3. Where terminal cabinets are used, provide full size plywood backboard to mount inside the terminal cabinet.

O. Painting:

1. Terminal cabinets, panels, junction boxes, pull boxes, etc., and conduit installed outdoors and in public view shall be painted with colors selected by the Architect to match the subject exterior surface. Refer to painting section of the specifications for additional requirements.

P. Seismic Design and Anchoring of Electrical Equipment:

1. Seismic anchorage of electrical equipment shall conform to C.C.R. Title 24, 2022 CBC. Anchorage details for roof/floor mounted equipment shall be as shown on plans.

PART 3 - EXECUTION

3.1 PREPARATION AND INSTALLATION

A. Installation of Conduit and Outlet Boxes:

1. All conduit installed in concrete and masonry shall be galvanized rigid steel conduit (GRC), or intermediate metal conduit (IMC).

2. Rigid conduit may be installed under floor slabs, under concrete sidewalls and as noted on the Drawings. Rigid conduit installed under slabs shall be 1" trade size minimum and shall be wrapped with 20 mil. polyvinyl chloride plastic tape.

3. All conduit except as hereinafter specified, installed in concrete, masonry and block walls, or damp or hazardous location, or subject to mechanical injury shall be heavy wall, threaded, galvanized rigid steel conduit (GRC), or intermediate metal conduit (IMC). Installation of conduit in block walls shall be approved by the Structural Engineer prior to rough-in.

4. Flexible steel conduit shall be permitted to be used at light fixture outlets, building seismic separations, and connections to vibrating electrical equipment. Flexible steel conduit runs shall be less than 6'-0". All outdoor installation shall be made using liquid-tight flex with approved fittings. Use of flexible conduit shall be as approved by the Engineer.

5. Intermediate metal conduit (IMC), is approved for use in all locations as approved for GRC or EMT and in accordance with Article 345 of CEC and UL Information card #DYBY.

6. All conduit installed in the dry walls or ceilings of the building shall be steel tube (EMT), Galvanized Rigid Steel (GRC), or Intermediate Metal Conduit (IMC).

7. NM sheathed cable is not allowed.

8. Conduit shall be run so as not to interfere with other piping fixtures or equipment.

9. The ends of all conduit shall be cut square, carefully reamed out to full size and shall be shouldered in fitting.

10. No running threads will be permitted in locations exposed to the weather, in concrete or underground. Special union fittings shall be used in these locations.

11. Underground conduit shall be, unless otherwise indicated, Schedule 40 PVC (polyvinyl chloride) installed at depth of not less than 24" below grade, concrete encased with a minimum of 3” concrete envelope and 2” minimum between conduits. Conduit separation shall be maintained using plastic spacers located at 10'-0" intervals. Where power and communication/signal conduits are run in a common trench a (12") inch minimum separation shall be maintained between power and communication/signal conduits. The grounding wire in plastic conduit shall be rated in accordance with Article 250 of 2022 CEC. Conduit encasement will not be required for conduits installed under the building slab (building footprint).

12. All underground or imbedded conduit shall be 1" minimum trade size for steel and for PVC.

13. Where underground power feeder conduit runs stub-up, conduit shall transition to GRC underground. The contractor shall use GRC elbows and GRC risers wrapped in 20 mil. PVC tape for stub-ups. Conduit stub-ups for branch circuits and low voltage systems shall be PVC.

14. PVC conduit shall not be run in walls or above ground.

15. Where underground conduit runs penetrate floor slab, conduit shall terminate 6” above finished floor with a grounding bushing.

16. Underground stub-ups at the generator shall extend, unbroken, 20” above finished grade.

17. Underground conduit shall not be run under the generator or fuel tank.

18. Where conductors enter a raceway in a cabinet, pull box, junction box, or auxiliary gutter, the conductors shall be protected by a plastic bushing type fitting providing a smoothly rounded insulating surface.

19. Where conduit extends through roof to equipment on roof area, this Contractor shall provide 24 gauge galvanized sheet metal flashing cones with 4" flanges on roof surface. This flashing shall be delivered to the roofing contractor for installation. The actual location of all such roof penetrations and outlet shall be verified by the Contractor.

20. All conduit underground, in masonry and concrete walls, and where concealed under floor slabs shall have joints painted with thread compound prior to makeup. Conduit shall not be installed horizontally in concrete floors.

21. Conduit run in block walls shall be installed as required by the Structural Engineer. Refer to Structural block wall installation details for allowable methods of conduit in the block walls of the building.

22. All conduit shall be supported at intervals not less than 6'-0" and within 12" from any outlet and at each side of bends and elbows. Conduit supports shall be galvanized, heavy stamped, two hole conduit clamp properly secured.

23. Where conduit racks are used the rack shall consist of two piece conduit clamps attached to galvanized steel slotted channels, properly secured via threaded rods attached directly to the building structure.

24. Nail-in conduit supports and staples will not be allowed. One piece set-screw type conduit clamps or perforated iron for supporting conduit will not be permitted.

25. Seismic Conduit Support:

    a. All conduit shall be supported in such a manner that it is securely attached to the structure of the building. Attachment is to be capable of supporting the tributary weight of conduit and contents in any direction. Maximum spacing of support and braces are to be as follows:

CONDUIT TYPE	MAXIMUM SPACING
EMT, IMC	10'-0"
GRC (3/4” thru 1 ½”)	10'-0"
GRC (2” thru 2½”)	16'-0"
GRC (3” and larger)	20'-0"

26. All conduit runs shall be installed parallel or perpendicular to walls, structural members, or intersection of vertical planes and ceilings. Field made bends and offset shall be avoided where possible. Crushed or deformed raceway shall not be installed.

27. Open knockouts in outlet boxes only where required for inserting conduit.

28. Outlet boxes on metal studs shall be attached to metal hangers, tack welded or bolted to studs; on wood studs attachment shall be with wood screws, nails not acceptable.

29. Recessed panels shall be provided with (4) ¾” spare conduit stub-ups into accessible ceiling space. Surface mounted panels secured to stud walls shall be secured to wall using 1/2" x 3" screws into steel backing plate provided by the Architect.

30. All boxes shall be covered with outlet box protector, Appleton SB-CK. Keep dirt from entering box or panels. If dirt does get in, it shall be removed prior to pulling wires.

31. All boxes installed outdoors shall be suitable for outdoor installations, gasketed, screw cover and painted as directed by the Architect with weatherproof paint to match building.

32. All conduit entries to outdoor mounted panels, cabinets, boxes, etc., shall be made using Myers "SCRU-TITE" hubs Series ST.

33. All conduit shall have a 200 lb test poly-propylene pull line left in place for future use in all runs tagged with a plastic tag at terminating end indicating the location of the opposite end of the conduit.

34. All rotating electrical equipment shall be supplied with flexible, liquid-tight conduit with appropriate slack and shall not exceed thirty-six (36) inches.

35. All multiple conduit runs within suspended ceilings shall be suspended from building structure by means of unistrut hangers/rack, see note 23. Refer to note 22 for support of single conduit runs within suspended ceilings. Conduit shall not be allowed to lay on ceiling or be supported from ceiling suspension wires or other suspension system.

36. Provide complete conduit system for all line voltage systems. Provide conduit for low voltage systems installed over inaccessible ceilings and in rooms with no dropped ceilings (open ceilings). The Contractor shall coordinate the location of inaccessible or open ceilings with the Architectural Reflected Ceiling Plan and in the filed with the ceiling contractor prior to rough-in.

37. All raceways shall be installed concealed in walls, floors or ceilings. Exposed raceways shall be permitted only in open ceiling (no T-bar or hard-lid ceiling) areas, unless specifically approved in writing by the Architect/Engineer. When approved by the Architect/Engineer exposed raceways in public spaces shall be as manufactured by Wiremold or approved equal, conduit may be used in utility spaces. Exposed raceways shall be painted to match the finish of the surface to which it is supported to.

38. Provide minimum 18” square ceiling access panels for devices, outlets, junction/pull boxes installed over inaccessible ceilings. Refer to the Architectural Reflected Ceiling plans for location of hard-lid/gyp board ceilings.

39. Install two (2) 2”C. sleeves in the common wall between the ceiling space of a room on the other side of a corridor. The sleeves shall be used for routing of low voltage wire/cable thru full height walls and fire rated walls. Sleeves shall be sealed to prevent transmission of noise between the room and the corridor.

40. Install four (4) 2”C. sleeves in each of the common walls between the ceiling space of the Communications room and the adjacent corridor. The sleeves shall be used for routing of low voltage wire/cable thru the full height walls and fire rated walls. Sleeves shall be sealed to prevent transmission of noise between the room and the corridor.

B. Installation of Conductors:

1. All line voltage wire, including control circuits, shall be installed in conduit.

2. All communications wire/cable shall be listed for open wiring (without conduit) and shall be plenum rated. Communications wire/cable shall be supported by “J” hooks installed along the perimeter walls of the building or full-height interior walls.

3. Low voltage wiring installed over inaccessible ceilings or rooms with no suspended ceilings shall be installed in conduit. Conduit shall be provided and installed by the Contractor and sized for the quantity of wire/cables contained therein and in compliance with the CEC. Conduit may not be shown on plan but is required in rooms with no suspended ceilings shall be installed in conduit.

4. Low voltage/Communications wire/cable installed below grade shall be U.L. listed for the application.

5. All line voltage circuits and feeder wires shall be continuous from the service point to terminal or farthest outlet. No joints shall be made except in pull, junction or outlet boxes, or in panel or switchboard gutters.

6. All low voltage wire/cables shall be continuous from the service point to terminal or farthest outlet. No joints will be allowed.

7. Thoroughly clean all conduit and wire-ways and see that all parts are perfectly dry before pulling any wires. No line voltage joint shall be made except in pull, junction or outlet boxes, or in panel or switchboard gutters.

8. Provide conduit only for routing of HVAC control wiring. Refer to Mechanical drawings for conduit requirements.

9. Install UL approved, fixture wire from all lighting fixture lamp sockets into fixture outlet or junction box.

C. Joints in 600 Volt Conductors:

1. Joints in 600 volt conductors smaller than No. 4 AWG shall be made with Scotchlok spring type connectors. Wires No 4 AWG and larger shall be joined together with approved type of pressure connector and taped with #33 3M tape, three (3) layers minimum to provide insulation not less than that of conductor. Connections to switch or busbar shall be made with one-piece copper lugs. Splicing of all 600 volt or less in-line connections #2 AWG through 350 MCM shall be made with 3M brand PST connector.

2. Joints/splices will not be permitted in underground pull boxes unless specifically authorized by the Engineer.

D. Grounding:

1. Provide grounding for entire electric installation as shown on plans and as required by applicable codes. Included as requiring grounding are:

a. Conduit.

b. Neutral or identified conductors of interior wiring system.

c. Switchboards, Power Distribution Panels and Branch Circuit Panelboards.

d. Non-current carrying metal parts of fixed equipment.

e. Telephone distribution equipment.

2. Ufer ground shall be provided at the building's "service" panel to meet the resistance specified herein. The size of the ufer grounding conductor shall be not less than that set forth in the latest edition of the California Code of Regulations, Title 24, State of California and CEC, unless otherwise indicated.

3. Grounding and bonding conductors shall be sized per the latest edition of the California Code of Regulations, Title 24, State of California and the CEC.

4. Provide and install an equipment grounding conductor in all feeder and branch circuit conduits.

5. Where required to be installed, ground rods shall be 3/4" x 10', copper clad, installed individually or grouped as required to meet the specified resistance. Provide ground rods with all required clamps, fittings, wire and concrete boxes.

6. Building grounding system resistance to ground shall not exceed 25 ohm.

7. Grounding resistance to ground for the communications system equipment room (Data room) shall not exceed 5 ohm to ground.

E. Prefabricated Equipment: Installation of all prefabricated items and equipment shall conform to the requirements of the manufacturer's specifications and installation instruction pamphlets. Where code requirements affect installation of materials and equipment, the more stringent requirements, code or manufacturer's instructions and/or specifications, shall govern the work.

END OF SECTION

SECTION 26 05 73

OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1 GENERAL

1.1 SUMMARY

A. Section includes arc flash study and short circuit and protective device coordination study encompassing portions of electrical distribution system from emergency and normal power source or sources up to and including breakers in service entrance switchboard, main breaker in sub-distribution panels, main breaker in each panelboard and breaker provided with the generator.

B. Adjustable circuit breaker settings and non-adjustable circuit breaker selections shall be based on the results of the coordination study to ensure a local fault does not trip any upstream circuit breaker. Refer to 26 05 73 Item 1.7 for additional requirements.

C. Panel and circuit breaker short circuit ratings shall be based on the results of the study's short circuit calculation results.

D. Provide arc-flash labels for switchboards and panels. Labels shall indicate the nominal system voltage, arc flash PPE category, arc flash boundary, minimum arc rating of clothing.

E. Study shall be performed by the Contractor's third party consultant.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:

1. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (Buff Book).

B. National Fire Protection Association:

1. NFPA 70 - California Electrical Code.

1.3 DESIGN REQUIREMENTS

A. Complete Short Circuit and Protective Device Coordination Study to meet requirements of NFPA 70.

B. Report Preparation:

1. Prepare study prior to ordering distribution equipment to verify equipment ratings required.

2. Perform study with aid of computer software program.

3. Obtain actual settings for packaged motor characteristics for equipment incorporated into Work.

4. Calculate short circuit interrupting and, when applicable, momentary duties for assumed 3-phase bolted fault short circuit current and phase to ground fault short circuit current at each of the following:

a. Utility supply bus.

b. Automatic transfer switch.

c. Engine generator.

d. Low-voltage switchgear.

e. Switchboards.

f. Distribution panelboards.

g. Branch circuit panelboards.

h. Each other significant equipment location throughout system.

C. Report Contents:

1. Include the following:

a. Calculation methods and assumptions.

b. Base per unit value selected.

c. One-line diagram.

d. Source impedance data including power company system available power and characteristics.

e. Typical calculations.

1) Fault impedance.

2) X to R ratios.

3) Asymmetry factors.

4) Motor fault contribution.

5) Short circuit kVA.

6) Symmetrical and asymmetrical phase-to-phase and phase-to-ground fault currents.

7) Tabulations of calculation quantities and results.

f. One-line diagram revised by adding actual instantaneous short circuits available.

g. State conclusions and recommendations.

2. Prepare time-current device coordination curves graphically indicating coordination proposed for system, centered on conventional, full-size, log-log forms.

3. Prepare with each time-curve sheet complete title and one-line diagram with legend identifying specific portion of system covered by that particular curve sheet.

4. Prepare detailed description of each protective device identifying its type, function, manufacturer, and time-current characteristics. Tabulate recommended device tap, time dial, pickup, instantaneous, and time delay settings.

5. Plot device characteristic curves at point reflecting maximum symmetrical fault current to which device is exposed. Include on curve sheets the following:

a. Power company relay characteristics.

b. Power company fuse characteristics.

c. Low voltage equipment circuit breaker trip device characteristics.

d. Low voltage equipment fuse characteristics.

e. Cable damage point characteristics.

f. Pertinent transformer characteristics including:

1) Transformer full load current.

2) Transformer magnetizing inrush.

3) ANSI transformer withstand parameters.

4) Significant symmetrical fault current.

g. Pertinent motor characteristics.

h. Other system load protective device characteristics.

1.4 SUBMITTALS

A. Qualifications Data: Submit the following for review prior to starting study.

1. Submit qualifications and background of firm.

2. Submit qualifications of Professional Engineer performing study.

B. Software: Submit for review information on software proposed to be used in performing study.

C. Product Data: Submit the following:

1. Report: Summarize results of study in report format including the following:

a. Descriptions, purpose, basis, and scope of study.

b. Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short-circuit duties, and commentary regarding same.

c. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.

d. Fault current calculations including definition of terms and guide for interpretation of computer printout.

D. Submit copies of final report signed by professional engineer. Make additions or changes required by review comments.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with CEC requirements.

B. Maintain one copy of each document on site.

C. Use commercially available software, designed specifically for short circuit and protective device coordination studies with minimum of five years documented availability.

D. Perform study in accordance with IEEE 242.

1.6 QUALIFICATIONS

A. Study Preparer: Company specializing in performing work of this section with minimum five years documented experience and having completed five projects of similar size and complexity within the past two years.

B. Perform study under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of California with minimum of five years experience in power system analysis.

C. Demonstrate company performing study has capability and experience to provide assistance during system start up.

1.7 SEQUENCING

A. Submit short circuit and protective device coordination study to Architect/Engineer prior to receiving final approval of distribution equipment shop drawings and prior to releasing equipment for manufacturing.

B. When formal completion of study will cause delay in equipment manufacturing, obtain approval from Architect/Engineer for preliminary submittal of study data sufficient in scope to ensure selection of device ratings and characteristics will be satisfactory. Final study shall be submitted prior to installing power distribution equipment.

1.8 SCHEDULING

A. Schedule work to expedite collection of data to ensure completion of study for final approval of distribution equipment shop drawings and prior to release of equipment for manufacturing.

1.9 COORDINATION

A. The professional performing the study shall be responsible for contacting the serving utility company and obtaining all values required for the completion of the overcurrent protective device coordination study.

B. The professional performing the study shall be responsible for contacting the generator manufacturer and obtaining the manufacturer and trip curves for the circuit breakers being provided with the generator and including the generator circuit breakers in the overcurrent protective device coordination study.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Provide assistance to electrical distribution system equipment manufacturer during start up of electrical system and equipment.

3.2 ADJUSTING

A. Perform field adjustments of protective devices and modifications to equipment to place equipment in final operating condition. Adjust settings in accordance with approved short circuit and protective device coordination study. Field adjustments to be performed by the equipment manufacturer's certified representative.

END OF SECTION

SECTION 26 08 00

COMMISSIONING OF ELECTRICAL SYSTEMS

1. 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. The OPR and BOD documentation are included by reference for information only.

1.2. SUMMARY

A. This section includes commissioning process requirements for Electrical Lighting systems, assemblies, controls, and related equipment. Commissioning will be completed to meet the requirements of 2022 California Green Building Code ("CALGreen") and LEED™ Rating System, Version 4.

B. Related Sections:

1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

1.3. DESCRIPTION

A. Refer to Division 01 Section "General Commissioning Requirements" for the description of commissioning.

1.4. DEFINITIONS

A. Refer to Division 01 Section "General Commissioning Requirements" for definitions.

1.5. SUBMITTALS

A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's role.

B. Refer to Division 01 Section "Submittals" for specific requirements. In addition, provide the following:

C. In addition, provide the following:

1. Certificates of readiness

2. Certificates of completion of installation, prestart, and startup activities.

3. O&M manuals

4. Test reports

1.6. QUALITY ASSURANCE

A. Test Equipment Calibration Requirements: Contractors will comply with test manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.7. COORDINATION

A. Refer to Division 01 Section “General Commissioning Requirements” for requirements pertaining to coordination during the commissioning process.

2. PART 2 PRODUCTS

2.1. TEST EQUIPMENT

A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the Contractor for the equipment being tested. For example, the electrical contractor of Division 26 shall ultimately be responsible for all standard testing equipment for the electrical systems and controls systems in Division 26. A sufficient quantity of two-way radios shall be provided by each contractor.

B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the base bid price to the Owner and left on site, except for stand-alone data logging equipment that may be used by the CxA.

C. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon completion of the commissioning process.

D. Data logging equipment and software required to test equipment will be provided by the CxA, but shall not become the property of the Owner.

E. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Light meter Accuracy ±5% rdg, Max Resolution 0.01Fc/0.1Lux.

3. PART 3 EXECUTION

3.1. GENERAL DOCUMENTATION REQUIREMENTS

A. The Installing Contractor shall prepare Pre-Functional Checklists for all commissioned components, equipment, and systems based on the manufacturers documentation and submit to the CxA for review and approval. This documentation shall be submitted with and within the time frame as O&M literature.

B. Red-lined Drawings:

1. The contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.

2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.

3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.

4. The contracted party, as defined in the Contract Documents will create the as-built drawings.

C. Operation and Maintenance Data:

1. Contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems.

2. The CxA will review the O&M literature once for conformance to project requirements.

3. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the Contractor.

D. Demonstration and Training:

1. Contractor will provide demonstration and training as required by the specifications.

2. A complete training plan and schedule must be submitted by the Contractor to the CxA four weeks (4) prior to any training.

3. A training agenda for each training session must be submitted to the CxA one (1) week prior the training session.

4. The CA shall be notified at least 72 hours in advance of scheduled tests so that testing may be observed by the CA and Owner's representative. A copy of the test record shall be provided to the CA, Owner, and Architect.

5. Engage a Factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specific equipment.

6. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, trouble shooting, servicing, and maintaining equipment.

7. Review data in O&M Manuals.

E. Systems manual requirements:

1. The Systems Manual is intended to be a usable information resource containing all of the information related to the systems, assemblies, and Commissioning Process in one place with indexes and cross references.

2. The GC shall include final approved versions of the following information for the Systems Manual:

a. As-Built System Schematics

b. Verified Record Drawings

c. Test Results (not otherwise included in Cx Record)

d. Periodic Maintenance Information for computer maintenance management system

e. Recommendations for recalibration frequency of sensors and actuators

f. A list of contractors, subcontractors, suppliers, architects, and engineers involved in the project along with their contact information

g. Training Records, Information on training provided, attendees list, and any on-going training

3. This information shall be organized and arranged by building system, such as fire alarm, chilled water, heating hot water, etc.

4. Information should be provided in an electronic version to the extent possible. Legible, scanned images are acceptable for non-electronic documentation to facilitate this deliverable.

3.2. CONTRACTOR'S RESPONSIBILITIES

A. Perform commissioning tests at the direction of the CxA.

B. Attend construction phase controls coordination meetings.

C. Participate in Electrical systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.

D. Provide information requested by the CxA for final commissioning documentation.

E. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or sub-contract written.

F. Prepare preliminary schedule for Electrical system orientations and inspections, operation and maintenance manual submissions, training sessions, equipment start-up and task completion for owner. Distribute preliminary schedule to commissioning team members.

G. Update schedule as required throughout the construction period.

H. During the startup and initial checkout process, execute prefunctional checklists for all commissioned equipment.

I. Assist the CxA in all verification and functional performance tests.

J. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

K. Gather operation and maintenance literature on all equipment, and assemble in binders as required by the specifications. Submit to CxA 45 days after submittal acceptance.

L. Coordinate with the CxA to provide 48-hour advance notice so that the witnessing of equipment and system start-up and testing can begin.

M. Notify the CxA a minimum of two weeks in advance of the time for start of the testing and balancing work. Attend the initial testing and balancing meeting for review of the official testing and balancing procedures.

N. Participate in, and schedule vendors and contractors to participate in the training sessions.

O. Provide written notification to the GC and CxA that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.

    a. Electrical equipment including lighting, lighting controls, and lighting control panels.

P. The equipment supplier shall document the performance of his equipment.

Q. Provide a complete set of red-lined drawings to the CxA prior to the start of Functional Performance Testing.

R. Provide training of the Owner’s operating staff using expert qualified personnel, as specified.

S. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner, to keep warranties in force.

2. Assist in equipment testing per agreements with contractors.

3. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.

T. Refer to Division 01 Section “General Commissioning Requirements” for additional Contractor responsibilities.

3.3. OWNER'S RESPONSIBILITIES

A. Refer to Division 01 Section "General Commissioning Requirements" for Owner's Responsibilities.

3.4. DESIGN PROFESSIONAL'S RESPONSIBILITIES

A. Refer to Division 01 Section "General Commissioning Requirements" for Design Professional's Responsibilities.

3.5. CxA'S RESPONSIBILITIES

A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's Responsibilities.

3.6. TESTING PREPARATION

A. Certify in writing to the CxA that Electrical systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify in writing to the CxA that Electrical instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Certify in writing that testing procedures have been completed and that testing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.7. GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Scope of Electrical testing shall include the entire Electrical installation, from the incoming power equipment throughout the distribution system. Testing shall include measuring, but not limited to resistance, voltage, and amperage of system(s) and devices.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the Electrical contractor and other contracted subcontractors, including the fire alarm Subcontractor shall prepare detailed testing plans, procedures, and checklists for Electrical systems, subsystems, and equipment.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct that set points be altered when simulating conditions is not practical.

H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed because of a deficiency outside the scope of the Electrical system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.8. ELECTRICAL SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual Division 26 sections. Provide submittals, test data, inspector record, and certifications to the CA.

B. Electrical Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in. Assist the CxA with preparation of testing plans.

C. Electrical Distribution System Testing: Provide technicians, load banks, infrared cameras, instrumentation, tools and equipment to test performance of designated systems and devices at the direction of the CxA. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested

D. Vibration and Sound Tests: Provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation and seismic controls.

E. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems and sub-systems. The following equipment and systems shall be evaluated:

1. Lighting & Controls
2. Occupancy Sensors
3. Automatic Photocell Dimmer Controls
4. Dimmer Switches
5. On/Off Switches
6. Renewable Energy System

3.9. DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT

A. Refer to Division 01 Section “General Commissioning Requirements” for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.

3.10. APPROVAL

A. Refer to Division 01 Section “General Commissioning Requirements” for approval procedures.

3.11. DEFERRED TESTING

A. Refer to Division 01 Section “General Commissioning Requirements” for requirements pertaining to deferred testing.

3.12. OPERATION AND MAINTENANCE MANUALS

A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements as stated in Division 01.

B. Refer to Division 01 Section “General Commissioning Requirements” for the AE and CxA roles in the Operation and Maintenance Manual contribution, review and approval process.

3.13. TRAINING OF OWNER PERSONNEL

A. Refer to Division 01 Section “General Commissioning Requirements” for requirements pertaining to training.

B. Electrical Contractor. The electrical contractor shall have the following training responsibilities:

1. Provide the CA with a training plan two weeks before the planned training.

2. Provide designated Owner personnel with comprehensive training in the understanding of the systems and the operation and maintenance of each major piece of commissioned electrical equipment or system.

3. Training shall start with residential units sessions, if necessary, followed by hands on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.

4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.

5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer’s representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.

6. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.

7. Training shall include:

a. Use the printed installation, operation and maintenance instruction material included in the O&M manuals.

b. Include a review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.

c. Discuss relevant health and safety issues and concerns.

d. Discuss warranties and guarantees.

e. Cover common troubleshooting problems and solutions.

f. Explain information included in the O&M manuals and the location of all plans and manuals in the facility.

g. Discuss any peculiarities of equipment installation or operation.

8. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance of all pieces of equipment.

9. The electrical contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.

10. Training shall occur after functional testing is complete, unless approved otherwise by the Owner's.

END OF DOCUMENT

SECTION 26 24 13

SWITCHGEAR

PART 1 - GENERAL

1.1 SCOPE

A. Work of this section includes everything necessary for or incidental to completing the electrical work, to provide a complete and operable electrical system, except as herein specifically excluded.

B. Section 260000 shall apply to this section as though written herein completely.

1.2 GENERAL REQUIREMENTS

A. Electrical System Characteristics: 120/208V. 3PH, 4W.

B. Guarantee: Furnish a written guarantee for a period of one-year from date of acceptance.

C. Codes and Regulations: Work done under this Section shall comply with the latest edition of the following: California Electrical Code, State of California Title 24, State Building Standards, Occupational Safety and Health Administration (OSHA) requirements, State of California Title 17 and to all local codes having jurisdiction. In the case where the codes have different levels of requirements, the most stringent rule shall apply.

D. The General and Supplementary Conditions, as well as Special Conditions apply in addition to items in the Electrical Section. Special attention is directed to the following sections:

1. Drawings and Specifications at the site.

2. Shop drawings and samples.

3. Guarantee.

4. Tests.

E. Testing:

1. Shall be in accordance with NETA ATS.

2. Copies of factory tests shall be submitted for review.

3. All certified test reports shall be submitted to the Owner at completion of project.

F. Shop Drawings/Product Submittals:

1. Drawings shall be submitted in six (6) bound sets accompanied by Letter of Transmittal, which shall give a list of the number and dates of the drawings submitted. Drawings shall be complete in every respect and bound in sets.

2. The Drawings submitted shall be marked with the name of the project, numbered consecutively and bear the approval of the Contractor as evidence that the Drawings have been checked by the Contractor. Any Drawings submitted without this approval will be returned to the Contractor for resubmission.

3. If the shop drawings show variations from the requirements of the Contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in his letter of transmittal. If the substitution is accepted, the Contractor shall be responsible for proper adjustment which may be caused by the substitution. Complete working samples shall be submitted with all requests for substitution.

4. Shop drawings/product data shall be submitted on the following but not limited to:

   a. Switchgear accompanied by a copy of the Overcurrent Protective Device Coordination Study.

   b. Circuit breakers accompanied by a copy of the Overcurrent Protective Device Coordination Study.

   c. Refer to Section 260573 for Overcurrent Protective Device Coordination Study requirements.

5. Shop drawings shall include enclosure elevations indicating the location of all equipment, and one-line diagram.

1.3 IDENTIFICATION

A. In addition to the factory installed nameplate. Each feeder circuit breaker shall be provided with a nameplate indicating the load served. If no load is served the nameplate shall read “Spare”.

B. Nameplates shall be Micarta 1/8" thick and of approved size, with bevelled edges and engraved white letters 1/4" high minimum on black background. Each nameplate shall be provided with drillings and suitable mounting screws corresponding to finish of the nameplate. The inscriptions in each nameplate shall be as indicated on the Drawings.

1.4 MAINTENANCE, SERVICING, INSTRUCTION MANUALS AND WIRING DIAGRAMS

A. Prior to final acceptance, the Electrical Contractor shall furnish to the Owner at least four (4) copies of operating and maintenance and servicing instructions, as well as four (4) complete sets of wiring diagram.:

B. Wiring diagrams shall project specific. Two (2) copies shall be presented to the Electrical Engineer and four (4) copies to the Owner.

1.5 ELECTRICAL CONTRACTOR'S RESPONSIBILITY

A. After all requirements of the Specifications and/or the Drawings have been fully completed, representatives of the Owner will inspect the work. Contractor shall provide competent personnel to demonstrate the operation of any item or system to the full satisfaction of each representative.

B. Final acceptance of the work will be made by the Owner after receipt of approval and recommendation of acceptance from each representative.

1.6 SUBSTITUTIONS

A. Substitution to specified equipment shall be submitted and received by the Engineer fifteen (15) days after the bid date for review and approval.

B. To receive consideration, requests for substitutions must be accompanied by documentary proof of its equality with the specified material. Documentary proof shall be in letter form and identify the specified values/materials alongside proposed equal values/materials. In addition, catalog brochures and samples must be included in the submittal.

C. The Contractor warrants that substitutions proposed for specified items will fully perform the functions required.

D. Substitutions or requests for substitution shall not be accepted and rejected for failure to comply with items A-C above.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials and Equipment: All electrical materials and equipment shall be new and shall be listed by Underwriter's Laboratories and bear their label, or listed and certified by a nationally recognized testing authority where UL does not have an approval. Custom made equipment must have complete test data submitted by the manufacturer attesting to its safety. In addition, the materials and equipment shall comply with the requirements of the following:

1. American Society of Testing Materials (ASTM).

2. Institute of Electrical and Electronics Engineers (IEEE).

3. National Electrical Manufacturer's Association (NEMA).

4. American National Standard Institute (ANSI).

5. International Electrical Testing Association (NETA).

B. Switchboard (including solid state trip main circuit breaker).

1. Provide switchboard with rating, components, dimensions and features as indicated on the Drawings. Switchboard shall consist of a solid state trip main circuit breaker and thermal-magnetic, ambient compensated, bolt-on type circuit breakers in a floor-standing, dead front, totally metal enclosed, NEMA 1 enclosure, requiring front access only. All sections shall be constructed of code gauge sheet metal. Sections shall consist of one (1) combination underground pull section and utility meter, one (1) combination main service disconnect section and distribution section. Switchboard and switchboard components shall be as manufactured by Eaton or approved equal Siemens, Square D or General Electric. Proposed alternate manufactured equipment must meet the configuration described herein and indicated on plan. Equipment manufactured by third party OEM is not acceptable.

2. Busbars:

a. Busbars shall be rectangular cross-section copper with silver-plated joints, full-height in each vertical section with horizontal cross busbars between sections. Bus bracing shall not be less than short-circuit indicated on the Drawings or utility requirements. Provide all lugs suitable for copper conductors. Shop drawings must show lug sizes based on the actual conductors to be provided.

b. Copper neutral busbar shall be 100% rated and shall have terminals for all active, spare, or inactive circuits.

c. Copper ground busbar shall be full length with provisions for future length extension.

3. The main circuit breaker shall be molded case type and have short circuit interrupting capacity of 65,000 AMPS symmetrical or per serving utility's requirements, whichever is greater. Provide solid state trip units with long-time and short-time and field functional test set. Circuit breaker long-time and short-time settings shall be factory set based on the Overcurrent Protective Device Coordination Study required by Section 26 05 73.

4. Feeder circuit breakers shall be the number of poles and current capacity indicated on the single line diagram. Provide circuit breakers with short circuit interrupting capacity to match the main circuit breaker. Circuit breakers shall be fully coordinated to ensure a local fault does not trip any upstream circuit breaker.

5. Provide screw-on nameplates for all feeder circuit breakers and the switchboard cover.

6. Nameplates shall be 1/8" thick, Micarta or Lamacoid plate or approved size, with bevelled edges and engraved white letters on black background.

7. Provide Arc-Fault warning labels on switchboard front cover.

8. All circuit breakers shall be provided with a device for locking circuit breaker in "OFF" position and terminals/lugs UL listed for 75˚C.

9. Refer to Section 26 05 73 for additional requirements. Switchgear and the overcurrent protective device coordination study must be submitted concurrently. A Switchgear submittal that does not include the overcurrent protective device coordination study will be considered incomplete.

C. Panelboards - Power Distribution:

1. Power distribution panelboards shall be floor mounted, dead front, totally metal enclosed, NEMA 1 enclosure, requiring front access only equipped with thermal-magnetic bolt-on type circuit breakers. Panels shall be maximum 36" wide, 24" deep and 90" high unless otherwise required by quantity of circuits indicated on the Single Line Diagram. Panelboard and panelboard components shall be as manufactured by Eaton or approved equal Siemens, Square D or General Electric to match the main switchboard manufacturer. Equipment manufactured by third party OEM is not acceptable.

2. Circuit breakers shall be fully rated to provide the symmetrical interrupting capacity indicated on the single line diagram. Circuit breakers shall be the number of poles and current capacity as indicated on the single line diagram. Circuit breakers shall be fully coordinated to ensure a local fault does not trip any upstream circuit breaker.

3. Provide screw-on nameplates for all feeder circuit breakers and the panelboard cover. Nameplates shall be 1/8" thick, Micarta or Lamacoid plate or approved size, with bevelled edges and engraved letters. For panels connected to normal power sources: Provide white letters on black background. For panels connected to emergency power sources: Provide white letters on red background.

4. All wiring shall be neatly arranged and laced together.

5. All circuit breakers shall be provided with a device for locking circuit breaker in "OFF" position and terminals/lugs UL listed for 75˚C.

6. Copper neutral busbar shall be 100% rated and shall have terminals for all active, spare, or inactive circuits.

7. Phase, neutral and ground bus bars shall be full size/height, rectangular in cross section, constructed of copper and interconnections.

8. Provide Arc-Fault warning labels on panel front covers.

9. Refer to Section 26 05 73 for additional requirements. Distribution panels and the overcurrent protective device coordination study must be submitted concurrently. A panel submittal that does not include the overcurrent protective device coordination study will be considered incomplete.

D. Panelboards – Branch Circuit:

1. Branch circuit panelboards shall be of the dead front safety type equipped with thermal-magnetic bolt-on type 40 deg C. circuit breakers. Panels shall be suitable for the disaggregation of loads with provisions for the installation of future current transformer (CT's). Enclosure shall be minimum 20" wide and 5-3/4" deep unless otherwise noted on plan. Refer to panel schedule for ratings and quantity of circuits to be provided. Panels shall be provided with copper busses. Branch circuit panelboards shall be Eaton or approved equal Siemens, Square D or General Electric to match the main switchboard manufacturer. Equipment manufactured by third party OEM is not acceptable.

2. Circuit breakers shall be fully AIC rated. Circuit breakers shall be the number of poles and current capacity as indicated on the panel schedule with terminals/lugs UL listed for 75˚C. Circuit breakers shall be fully coordinated to ensure a local fault does not trip any upstream circuit breaker.

3. Circuit breakers used to protect circuits serving the “R” occupancies of the Fire Station shall be combination arc-fault type. Circuits serving the kitchen, laundry, restroom receptacles, and receptacles within 6’-0” of sinks shall be protected by combination GFCI/Arc-Fault type circuit breakers. Refer to the Architectural Code Analysis drawings for occupancy boundaries.

4. Trims shall have doors equipped with flush type combination lock and catch, two milled type keys supplied with each panel. All locks shall be keyed alike and each door shall have a plastic covered directory frame with a typed identification card of all circuit and panel numbers for branch circuit panelboards and engraved lamacoid nameplates for power distribution panelboards.

5. Provide nameplate for all panelboards, 1/8" thick, Micarta or Lamacoid plate of approved size, with bevelled edges and engraved white letters on black background. Install nameplates on exterior trim of panel, above the panel door. For panels connected to normal power sources: Provide white letters on black background. For panels connected to emergency power sources: Provide white letters on red background.

6. All wiring shall be neatly arranged and laced together.

7. All circuit breakers shall be provided with a device for locking circuit breaker in "OFF" position.

8. Refer to Painting Section of these Specifications for all panel finish. Panel shall be primered for painting.

9. Copper neutral busbar shall be 100% and shall have terminals for all active, spare, or inactive circuits.

10. Phase, Neutral, and Ground bus bars shall be full height/size, rectangular in cross section constructed of copper and interconnections.

11. Provide Arc-Fault warning labels on panel front covers.

12. Where indicated on plan, panels housing time clocks and contactors for control of lighting shall be provided with an auxiliary section. Panel shall consist of a two-section panelboard with two boxes and one trim/cover, each with their own door/lock.

13. Refer to Section 26 05 73 for additional requirements. Panelboards and the overcurrent protective device coordination study must be submitted concurrently. A Panelboard submittal that does not include the overcurrent protective device coordination study will be considered incomplete.

E. Painting:

1. Switchboards installed outdoors and in public view shall be painted with colors selected by the Architect to match the subject exterior surface. Refer to painting section of the specifications for additional requirements.

F. Seismic Design and Anchoring of Electrical Equipment:

1. Seismic anchorage of electrical equipment shall conform to C.C.R. Title 24, 2022 CBC. Anchorage details for roof/floor mounted equipment shall be as shown on plans.

PART 3 - EXECUTION

3.1 PREPARATION AND INSTALLATION

A. Verify surface is suitable for switchboard installation.

B. Install in accordance with NEMA PB 2.1.

C. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

D. Ground and bond switchboards in accordance with CEC Article 250. Refer to Section 260000 for additional requirements.

E. Adjust operating mechanisms for free mechanical movement.

F. Tighten bolted bus connections.

G. Adjust circuit breaker trip and time delay settings to values indicated on the Overcurrent Protective Device Coordination Study.

H. Touch up scratched or marred surfaces to match original finish.

END OF SECTION

SECTION 26 31 00

PACKAGED PV SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This section shall consist of providing a packaged PV system with battery storage and all accessories as specified and required by the 2022 California Energy Commission Title 24. The equipment supplier must be the authorized distributor for each component of the products specified herein. The work includes the furnishing of all labor, materials, equipment, test, and training to provide a complete and workable solar power generating system, including the PV modules, inverters, battery storage, system monitoring, PV module support system and interconnecting conduit/wire, and specified herein. It is the intent of these specifications to have a single source responsibility for the PV modules, inverter, battery storage and support structure.

B. Any and all exceptions to the published specifications shall be subject to the approval of the engineer.

C. The power generating system shall be furnished by a solar integrator (contractor) who shall be responsible for the installation, coordination, and testing of the complete system. The contractor shall have documentary proof of being in business for ten (10) years and installed a minimum of ten (10) systems of equal or greater size. The entire system shall be installed as shown on the plans, drawings, and specifications herein.

D. The equipment shall be produced by a manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year.

E. The equipment shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production, installation, and service of the complete product line.

F. Complete and submit utility company interconnect agreement and required documentation (plans, diagrams, specifications and equipment data sheets) to the serving utility company for approval.

G. Secure and pay for required permits and approvals from the serving utility company.

H. Complete and submit utility company, State and local incentive/rebate program applications.

I. The PV system is the sole responsibility of the contractor. The PV contractor shall submit plans, equipment data sheets, wiring diagrams and calculations to the authority having jurisdiction (AHJ) for review and approval. The PV system submittal to the AHJ shall bear the stamp and signature of a professional engineer registered in the State of California.

J. Installation of the PV system shall commence upon approval of the PV plans by the AHJ.

1.02 GENERAL REQUIREMENTS

A. It is the intent of this specification to secure an electrical power generating system that has been tested during design verification, production and at the final job site. All finished equipment shall be of the lasted commercial design and will be complete with all of the necessary accessories for complete installation as shown on the plans, drawings, and specifications herein. The equipment supplied and installed shall meet the requirements of the 2022 California Electrical Code, along with all applicable local codes and regulations. All equipment shall be new and of current production of a national firm that manufactures PV modules, inverters and assembles them as a complete and coordinated system. There will be one source responsibility for warranty, parts, and service through a local representative with factory-trained servicemen.

B. The electrical power generating system shall be rated 13.2 kW (STC). System output may range between 18,828 kWh and 19,663 kWh per year.

C. Refer to Section 260000 for Submittal requirements.

1.03 RELATED DOCUMENTS

A. The following specification section apply to all work herein:

1. Section 260000 – General Electrical Requirements.

1.04 SUBMITTAL AND MANUALS

A. Comply with all requirements of the General Conditions, Supplementary Conditions and applicable sections of Divisions 1 and 16 of these specifications.

B. Additional requirements of this section are:

1. Within thirty-five (35) calendar days after the date of award of the Contract, the Contractor shall submit to the Architect for review, eight copies of a complete submission.

2. The submission shall consist of five major sections with each section separated with index tabs. Each page in the submission shall be numbered chronologically and shall be summarized in the index.

3. The first section shall be the "Index" which shall include the project title and address, name of the firm submitting the proposal and name of the Architect.

4. The second section shall include a copy of the Installing Contractors valid C-10 California State Contractors License, letters of factory authorization and guaranteed service, list of 10 projects of equal scope and list of proposed instrumentation to be used by the Contractor.

5. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished next to all of the specified equipment's features and functions as stated in the specifications and data sheets.

6. The fourth section shall contain an original factory data sheet for every piece of equipment in the specifications.

7. The fifth section shall contain a wiring designation schedule for each circuit leaving each piece of equipment and drawings showing system wiring plans.

8. The submittal shall also include, but not be limited to, a site plan indicating site distribution of system wire/cable, floor plans indicating location of equipment, system devices, required wire/cable between equipment and devices, site specific wiring/connection diagrams, system three-line diagram, equipment elevations indicating dimensions and the arrangement/placement of all wall/floor mounted equipment. Calculations for the PV system kW size, battery storage system, annual kWH production.

9. Submit installation details and structural calculations for the attachment of the roof mounted PV support system, PV module attachment to the support system, inverter and battery cabinet.

C. The Contractor shall provide two copies of an "Operating and Servicing Manual" for the system. The manuals shall be bound in flexible binders. All data shall be printed material or typewritten. Each manual shall include the following: Instructions necessary for the proper operation and servicing of the system; complete as-built installation drawings of the system; a wiring destination schedule for each circuit leaving for each piece of equipment; a schematic diagram of major components with all transistor and IC complements and replacement number.

PART 2 - PRODUCTS

2.01 INVERTER:

A. 208V. 3 phase, transformerless, string inverter with integral AC and DC disconnect switches, DC arc-fault protection, integrated DC fused string combiner, and 96.5% CEC efficiency. As manufactured by Sol-Ark #30K-3P-208V, or as required to meet the performance criteria indicated in 1.02.B herein.

B. Inverter must be battery storage ready.

2.02 PV MODULES

A. Modules shall be as manufactured by Phono Solar, 550W Twinplus Module, or approved equal by the project Electrical Engineer.

B. Module shall meet UL 61730 requirements, shall carry the CE mark and meet IEC 61215 and IEC 61730 standards.

C. Module shall have a 25 year power performance warranty for 80% of warranted minimum power.

D. Construction:

I. Front – Solar glass with anti-reflective surface treatment, 3.2mm (0.13”).

II. Back Sheet – Highly resistant polymer (black).

III. Frame – 1.5 mm Anodized aluminum (black).

E. The terminal box shall have integral built-in bypass diode protection (to preserve array output power during periods of local shading). The junction box shall be weather resistant, watertight, UV and microbe resistant and meet IEC 61215 edition 2 design. The junction box will have positive and negative, 12 AWG, dual insulated cables with UL listed polarized weatherproof connectors. Connectors will be IP65 designed and meet 2022 CEC standards.

F. The module manufacturer shall have been in business for more than 20 years with modules operating in the field for more than 20 years.

2.03 SUPPORT SYSTEM:

A. PV panels are to be mounted on the roof.

B. Roof support system shall be as manufactured by Unirac or approved equal. Contractor shall submit the design of the support system and structural calculations to the project/building Structural Engineer of Record (SEOR) for review. Contractor shall make revisions to the support system as required by the SEOR.

C. Contractor shall coordinate the placement and attachment of the support system with the general contractor and the roof contractor.

2.04 METERING, MONITORING SYSTEM:

A. A data acquisition system (DAS) shall be provided as part of the PV system. The DAS shall include instrumentation that allows the measurement of

1. Ambient temperature.

2. PV module temperature.

3. Wind speed.

4. Plane of array solar irradiation.

5. DC system voltage.

6. DC system current.

7. AC system power output.

8. Overall facility energy use in 15 minute increments whether the energy is from solar or the utility – in essence a utility company “shadow” meter.

B. The DAS shall include a data-logger, network interface device for data retrieval, Nema 4 enclosure, dry bulb temperature measuring device with radiation shield, anemometer, and solar sensor.

C. The DAS shall be certified by the California Solar Initiative and shall be listed on the Go solar California website.

D. The data acquisition system shall include 5-years of monitoring and hosting service on a secure website – per the minimum requirements of the California Solar Initiative.

E. Meters shall be provided and installed per the California Solar Initiative program and shall provide revenue grade interval data recording (IDR) meter complete with industry standard telemetry for communication with ethernet services. The contractor shall also provide a connection to the building’s energy management system (EMS) for the purpose of metering, monitoring and data collection of solar production. Meters must connect to a monitoring/data collection recording solar production through Time of Use (TOU) increments applicable to the local utility standards, with a minimum 15 minute intervals.

F. System shall include the DAS and weather station.

PART 3 - EXECUTION

3.01 Coordinate the placement and attachment of the PV modules to the support system with the support system installer.

3.02 Coordinate the placement and attachment of the solar support system to the roof with the general contractor and the roof contractor.

3.03 Coordinate the location of the DAS in the Data Room 133 to ensure required clearances are maintained. Route required communications conduit and wire between the DAS and the MDF and between the DAS and the inverter.

3.04 Coordinate the location of the weather station to ensure optimum performance.

3.05 Replace damaged PV modules and modules that are not performing to the manufacturer’s specifications with new modules.

3.06 Test inverter for compliance with the manufacturer's specifications. Replace damaged or non-performing inverter with new inverter.

3.07 Test the battery storage system for compliance with the manufacturer's specifications. Replace damaged or non-performing battery storage system.

3.08 Clean all module and inverter surfaces at completion of the project.

3.09 Refer to Architectural roof plan for the solar ready areas and Electrical plans for preferred PV system equipment locations.

3.10 Coordinate routing of PV conduit, equipment locations and connections to the facility power distribution system with the General Contractor and Electrical Contractor prior to rough-in.

END OF SECTION

SECTION 26 32 13

EMERGENCY ENGINE GENERATORS

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 packaged diesel engine generators for emergency use with the following features:

1. Diesel engine.
2. Alternator.
3. Unit-mounted radiator.
4. Diesel fuel-oil system.
5. Control and monitoring.
6. Generator overcurrent and fault protection.
7. Generator, exciter, and voltage regulator.
8. Outdoor engine generator enclosure.
9. Vibration isolation devices.
10. Finishes.

B. Related Requirements:

1. Section 263600 "Transfer Switches" for transfer switches, including sensors and relays to initiate automatic-starting and -stopping signals for engine generators.

1.3 DEFINITIONS

A. AREP: Auxiliary winding regulation excitation principle. Voltage support for the AVR comes from independent auxiliary windings located in the main stator.

B. AVR: Automatic voltage regulator.

C. EPS: Emergency power supply.

D. EPSS: Emergency power supply system.

E. Operational Bandwidth: The total variation, from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

F. PMG: Permanent magnet generator. Voltage support for the AVR comes from an independent auxiliary permanent magnet generator which is mounted on the shaft extension of the alternator.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. Include thermal damage curve for generator.

3. Include time-current characteristic curves for generator protective device.

4. Include fuel consumption in gallons per hour at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.

5. Include airflow requirements for cooling and combustion air in cubic feet per minute at 0.8 power factor, and reference air-supply temperature. Provide Drawings indicating requirements and limitations for location of air intake and exhausts.

6. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.

B. Shop Drawings:

1. Include plans and elevations for engine generator and other components specified. Indicate access requirements affected by height of subbase fuel tank.

2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

3. Identify fluid drain ports and clearance requirements for proper fluid drain.

4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

5. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and supported equipment. Include base weights.

6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for EPS equipment and functional relationship between all electrical components.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates for engine generator, accessories, and components, from manufacturer.

1. Component Importance Factor: 1.5

2. IBC pre-approved

B. Source Quality-Control Reports: Including, but not limited to, the following:

1. Certified summary of prototype-unit test report.

2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.

3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.

4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.

5. Report of sound generation at octave bands in accordance with ISO 8528-10.

6. Report of exhaust emissions showing compliance with applicable regulations.

7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For engine generators to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

b. Operating instructions mounted adjacent to generator location.

c. Training plan.

1.7 QUALITY ASSURANCE

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

1.8 WARRANTY

A. Comprehensive Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years or 3000 hours from date of generator commissioning.

1.9 PERMITS

A. The contractor shall be responsible for obtaining all permits, file applications and pay for all fees required for the following:

1. South coast air quality management district (SCAQMD) permit to construct.

2. SCAQMD permit to operate.

3. SCAQMD health risk screening analysis.

4. Planning Department environmental permit (air and noise).

5. Fire Marshal hazardous materials permit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide MTU Onsite Energy Corporation; 6R0113 DS150 or approved equal by the Engineer of Record:

1. MTU Onsite Energy Corporation.

   Contact: Collicutt Energy Services at (310) 245-0292 or Tony.Miccolis@collicutt.com

2. Alternate Manufacturers: Cummins, Kohler, Caterpillar. Preliminary equipment data, including performance data and dimensions, shall be submitted to the consulting engineer at least 10 working days prior to bid for preliminary review.

B. Source Limitations:

1. Obtain packaged engine generators and engines from a single manufacturer.

2. Obtain packaged engine generators and auxiliary components from a single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Engine generator housing, subbase fuel tank, engine generator, batteries, battery racks, silencers, sound attenuating equipment, accessories, and components shall withstand the effects of earthquake motions determined according to ASCE/SEI 7-10

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Shake-table testing shall comply with ICC-ES AC156. Testing shall be performed with all fluids at worst-case normal levels.

3. Component Importance Factor: 1.5.

4. IBC pre-approved

B. NFPA Compliance:

1. Comply with NFPA 37.

2. Comply with NFPA 70.

3. Comply with NFPA 99.

4. Comply with NFPA 110 requirements for Level 1 EPSS.

C. UL Compliance: Comply with UL 2200.

D. Engine Exhaust Emissions: Comply with EPA NSPS requirements for emergency generators and applicable state and local government requirements.

E. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at property line due to sound emitted by engine generator, including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation. Comply with ISO 8528-10 for sound measurements at 23.0 feet(7 m).

F. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: 122 deg F(50 deg C).

2. Relative Humidity: Zero to 100 percent.

3. Altitude: Sea level to 272 feet(83m)

2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

A. Factory assembled and tested, water-cooled engine, with brushless generator and accessories.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. EPSS Class: Engine generator shall be classified as a Class 96 according to NFPA 110.

D. Generator Set Rating: 150 kW.

E. Power Factor: 0.8 lagging.

F. Frequency: 60 Hz

G. Voltage: 208 -V ac.

H. Phase: Three-phase, four-wire wye.

I. Governor: Adjustable isochronous, with speed sensing.

J. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and engine generator center of gravity.

K. Capacities and Characteristics:

1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries.

2. Nameplates: For each major system component to identify manufacturer's name, model, and serial number, of component.

L. Engine Generator Performance:

1. Steady-State Voltage Operational Bandwidth: 0.25 percent of rated output voltage, from no load to full load, and one-percent for non-PMG alternators.

2. Load Factor: 85-percent load factor according to ISO 8528-1.

a. If below, supplier shall provide updated documents for performance modified to 85-percent load factor in regards to time before overhaul (TBO) and the respective maintenance schedule.

3. When facility loads are provided, a generator set sizing report from the manufacturer shall be provided, detailing each load, and the performance for each step.

4. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 3.5-seconds.

5. Steady-State Frequency Operational Bandwidth: 0.25 percent of rated frequency, from no load to full load, and 0.5 percent for mechanical governed engines.

6. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.

7. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.

8. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.

9. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically with PMG/AREP, without damage to generator system components.

10. Unit shall be capable of accepting 100 percent load step in one step per NFPA 110 requirements.

11. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.4 DIESEL ENGINE

A. Rated Engine Speed: 1800 rpm.

B. Lubrication System: Engine or skid mounted.

1. Filter and Strainer: Select according to engine manufacturer's requirements for particle removal.

2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.

3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

C. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity and with UL 499.

D. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator mounting frame and integral engine-driven coolant pump.

1. Coolant: Glycol-based antifreeze and water mixture for freeze protection to minus 20 deg F(minus 29 deg C), with anticorrosion additives as recommended by engine manufacturer.

2. Size of Radiator: Adequate to contain expansion of total system coolant, from cold start to 100 percent load condition.

3. Expansion Tank: Rated to withstand maximum closed-loop coolant-system pressure for engine used. Equip with gage glass and petcock. Replace gage glass with a pressure sensor when gage glass is located more than 8 feet(2.4 m) from the floor.

4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, UV-, and abrasion-resistant fabric.

    a. Rating: 50-psig(345-kPa) maximum working pressure with coolant at 180 deg F(82 deg C), and noncollapsible under vacuum.

    b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

E. Muffler/Silencer: Designed to meet sound attenuation levels as specified herein.

F. Air-Intake Filter: Single-stage, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

G. Starting System: Match engine ECU and genset control voltage requirements.

1. Components: Sized so they are not damaged during a full engine-cranking cycle, with ambient temperature at maximum specified in "Performance Requirements" Article.

2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.

3. Cranking Cycle: As required by NFPA 110 for system level specified.

4. Battery: Lead acid, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide NFPA 110 specified cranking cycle without recharging.

5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.

6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Include accessories required to support and fasten batteries in place.

    a. Compartment Heater: Thermostatically controlled heater shall be arranged to maintain battery above 50 deg F(10 deg C) regardless of external ambient temperature within range specified in "Performance Requirements" Article.

    b. Compartment Ventilation: Provide ventilation to exhaust battery gases.

7. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.

8. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation.

9. Battery Charger: Current-limiting, automatic-equalizing, and float-charging type designed for lead-acid batteries. Unit shall comply with UL 1236 and include the following features:

    a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.

b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg F(minus 40 deg C) to 140 deg F(plus 60 deg C) to prevent overcharging at high temperatures and undercharging at low temperatures.

1) Temperature Probe: Equip battery charger with a temperature probe on the negative cable when battery heaters are used.

c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.

d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.

e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.

f. Enclosure and Mounting: NEMA 250, Type 1 wall-mounted cabinet.

2.5 DIESEL FUEL-OIL SYSTEM:

A. Comply with NFPA 30.

B. Main Fuel Pump: Mounted on engine to provide primary fuel flow under starting and load conditions.

C. Fuel Filtering: Remove water and contaminants larger than 5 microns, or as recommended by the engine manufacturer.

D. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

E. Refer to Plumbing specifications for piping requirements between the aboveground fuel tank and the generator.

2.6 OUTDOOR ENGINE GENERATOR ENCLOSURE; Level 3 Enclosure, 73 dBA at 23ft

A. Description: Vandal-resistant, sound-attenuating, weatherproof steel housing, wind resistant up to 130 mph (209 km/h). Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Instruments and control shall be mounted within enclosure.

B. Description: Prefabricated or pre-engineered, galvanized-steel-clad, integral structural-steel-framed, skin-tight enclosure, erected on concrete foundation.

C. Seismic Design: Comply with State of California seismic requirements.

D. Hinged Doors: Manufacturer's standard construction with padlocking provisions.

E. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine generator components.

F. This generator will require Rypos Active Diesel Particulate Filter (DPF). No exceptions.

G. Engine-Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 100 percent of rated load for two hours with ambient temperature at top of range specified in system service conditions.

1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof, drainable, fixed, louvers to prevent entry of rain and snow.

2. Ventilation: Provide temperature-controlled exhaust fan interlocked to prevent operation when engine is running.

H. Interior Lights with Switch: Factory-wired, vapor-proof luminaires within housing; arranged to illuminate controls and accessible interior. Arrange for external electrical connection.

1. DC lighting system for operation when remote source and generator are both unavailable.

I. Sound Attenuation: When measured at 23.0 feet(7 m) from sides of unit, attenuation shall be 73 dBA or less. Octave band sound report shall be provided based on similar unit construction.

J. Overall Package dimensions should not exceed 145”L x 48”W x 106”H (Overall height includes height of diesel particulate filter), No Exceptions.

2.7 CONTROL AND MONITORING

A. Provide minimum run time control set for 15 minutes, with override only by operation of a remote emergency-stop switch.

B. Comply with UL 2200 for stationary engine generator assemblies.

C. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from engine generator vibration. Panel shall be powered from the engine generator battery.

D. Control and Monitoring Panel:

1. Digital controller with integrated LCD display, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.

a. MGC2020 controller with PLC logic incorporating drag and drop ladder logic available for the owner/user. Logic shall be designed such that all parameters within the generator set controller can be used in addition to additional inputs and outputs.

2. Instruments: Located on the control and monitoring panel and viewable during operation.

a. Engine lubricating-oil pressure gage.

b. Engine-coolant temperature gage.

c. DC voltmeter (alternator battery charging).

d. Running-time meter.

e. AC voltmeter, for each phase.

f. AC ammeter, for each phase.

g. AC frequency meter.

h. Digital generator-voltage-adjusting feature to allow plus or minus 5 percent adjustment.

3. Controls and Protective Devices: Controls, shutdown devices, and common visual alarm and pre-alarm indication as required by NFPA 110 for Level 1 system, including the following:

a. Run-Off-Auto switch.

b. Control switch not in automatic position alarm.

c. Overcrank shutdown device.

d. Low water temperature alarm.

e. Overspeed shutdown device.

f. Low-fuel alarm

g. Coolant low-level alarm.

h. Coolant high-temperature prealarm.

i. Coolant high-temperature alarm.

j. Coolant high-temperature shutdown device.

k. EPS under load indicator.

l. Battery high-voltage alarm.

m. Low-cranking voltage alarm.

n. Battery-charger malfunction alarm.

o. Battery low-voltage alarm.

p. Lamp test.

q. Contacts for local and remote common alarm.

r. Remote manual-stop shutdown device.

s. Generator overcurrent-protective-device not-closed alarm.

t. Generator over and under voltage

E. Common Remote Panel with Common Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine generator battery.

F. Remote Display Panel: Comply with NFPA 99. An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

1. Overcrank alarm.

2. Coolant low-temperature alarm.

3. High engine temperature prealarm.

4. High engine temperature alarm.

5. Low lube oil pressure alarm.

6. Overspeed alarm.

7. Low-fuel main tank alarm.

8. Low coolant level alarm.

9. Low-cranking voltage alarm.

10. Contacts for local and remote common alarm.

11. Audible-alarm silencing switch.

12. Run-Off-Auto switch.

13. Control switch not in automatic position alarm.

14. Fuel tank derangement alarm.

15. Fuel tank high-level shutdown of fuel-supply alarm.

16. Lamp test.

17. Low-cranking voltage alarm.

18. Generator overcurrent protective device not closed.

G. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.8 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.

1. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.

B. Generator Circuit Breaker: Molded-case, thermal-magnetic type; 100 percent rated; complying with UL 489. Quantity (1) 800, adjustable trip circuit breaker, set circuit breaker to trip at 800A, (1) 20A, 100% Rated Breaker For Rypos Active DPF.

1. Tripping Characteristic: Designed specifically for generator protection.

2. Trip Rating: Matched to generator output rating.

3. Mounting: Adjacent to or integrated with control and monitoring panel.

4. Coordination: Shall coordinate with the downstream circuit breaker in compliance with CEC Article 700.32.

C. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other engine generator protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:

1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other engine generator malfunction alarms. Contacts shall be available for load shed functions.

2. Under single- or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.

3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the engine generator.

4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

2.9 DIESEL PARTICULATE FILTER (DPF)

A. Acceptable Manufacturers include Rypos Inc model RH306-M and must meet the qualifications of a United States based supplier for both Confidential and Governmental clearances.

B. The DPF should be sized based on the engine data provided to achieve at least the levels equivalent to, CARB verification to level III+ for emissions reduction.

C. DPF shall incorporate Active regeneration in that it burns off the soot particles without a minimum exhaust temperature or engine minimum load or runtime requirements. It shall regenerate at low engine loads including under idling conditions.

D. Active DPF(s) shall be a minimum of 80% porous, and shall regenerate when energized electrically, independent of exhaust temperatures.

E. Active DPF(s) shall include differential pressure sensors to initiate and control regeneration process as a function of backpressure. Backpressure must not exceed 90% of the engine manufacturer's specification.

F. Active DPF(s) shall receive power from the Genset and the nominal power draw should not exceed 2% of the generator's rated power.

G. Passive Regeneration through use of the following methods is not acceptable:

a. An indirect heating source such as an electric heater that reduces the load capacity of the generator and requires increased run time and fuel consumption.

b. An integrated load bank that results in increased run times and fuel costs.

c. A separate combustion source used to increase the exhaust temperature such as a duct burner.

H. The Active DPF(s) shall meet the following minimum requirements:

a. PM Reduction: 85%

b. Hydrocarbon reduction: 75%

c. Carbon Monoxide reduction: 70%

d. Nitrogen Dioxide reduction (NO_2): 40%

I. The Active DPF shall

a. be suitable for horizontal mounting , with flanged inlets and outlets.

b. be coupled to engine exhaust outlets by means of an adequately sized section of corrugated flex. Flex connectors shall be flanged at both ends for mating to the engine and exhaust system.

c. act as a Critical Grade silencer.

d. have a 304 stainless steel enclosure.

J. The Active DPF(s) shall give operators visual notification and contact closure when:

a. Operating normally.

b. Backpressure exceeds normal operating conditions.

K. The DPF shall be able to operate effectively within the engine manufacturer's recommended operating profile, while operating within the acceptable backpressure range as specified by engine manufacturer; without limiting variation in engine loading levels and/or number of cold starts beyond specification by the engine manufacturer.

L. Install Rypos DPF on the roof of enclosure and wired to 20A breaker noted in section 2.8.B.

2.10 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H or Class F.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.

E. Range: Provide limited range of output voltage by adjusting the excitation level.

F. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

G. Enclosure: Dripproof.

1. Ingress Protection Rating (IP): Follow IEC 60529 and IP23.

H. Instrument Transformers: Mounted within generator enclosure.

I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.

1. Digital Adjustment on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.

J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

2.11 VIBRATION ISOLATION DEVICES

A. As recommended by the manufacturer to meet the following site requirements:

1. Maximum Vibration Transmission: 30 mm/s.

2. Based on ISO 8528-9 for vibration.

B. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

2.12 FINISHES

A. Outdoor Enclosures and Components: Powder-coated finish over steel enclosure.

1. Components: Liquid paint.

2.13 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.

B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.

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

3.2 PREPARATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to 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 Construction Manager/Owner no fewer than seven (7) days in advance of proposed interruption of electrical service.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections with the assistance of a factory-authorized service representative.

E. Tests and Inspections:

1. Perform tests recommended by manufacturer and in "Visual and Mechanical Inspection" and "Electrical and Mechanical Tests" subparagraphs below, as specified in the NETA ATS. Certify compliance with test parameters.

2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.

3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.

   a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.

   b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.

   c. Verify acceptance of charge for each element of the battery after discharge.

   d. Verify that measurements are within manufacturer's specifications.

4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.

5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.

6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg(120 kPa). Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.

7. Exhaust Emissions Test: Comply with applicable government test criteria.

8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.

9. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 percent and 100 percent of rated linear load. Verify that harmonic content is within specified limits.

F. Coordinate tests with tests for transfer switches, and run them concurrently.

G. Test instruments shall have been calibrated within the past 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.

H. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.

I. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

3.5 MAINTENANCE CONTRACT

A. Generator supplier to provide a one-year maintenance contract, two times per year with load bank testing. On the 6th month following start-up, a visual inspection will be conducted along with topping off fluids (coolant & oil) Diesel fuel not included. On the 12th month following start up, a visual inspection will be conducted along with an oil and filter change with a 2-hour load bank test. (Load bank test report will be provided to the end user)

END OF SECTION

SECTION 26 36 00

AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1.1 SCOPE

Furnish and install automatic transfer switches (03ATS) with number of poles, amperage, voltage, and withstand current ratings as shown on the plans. (ASCO Catalog No. H03ATSA30600N5XC (11BE,18RX,31Z) or approved equal by the Engineer of Record. Each automatic transfer shall consist of a mechanically held power transfer switch unit and a microprocessor controller, interconnected to provide complete automatic operation. All transfer switches and control panels shall be the product of the same manufacturer.

1.2 ACCEPTABLE MANUFACTURERS

Automatic transfer switches shall be ASCO Series 300 (03ATS). Any alternate shall be submitted to the consulting engineer in writing at least 10 working days prior to bid for review. Each alternate bid must list any deviations from this specification. ATS must be fully compatible with the generator.

1.3 CODES AND STANDARDS

A. UL 1008 - Standard for Automatic Transfer Switches.

B. CSA C22.2 No.178 – 1978

C. NFPA 70 - National Electrical Code

D. NFPA 99 – Health Care Facilities

E. NFPA 110 - Emergency and Standby Power Systems

F. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications

G. NEMA Standard ICS10-2005 (formerly ICS2-447) - AC Automatic Transfer Switches

H. NEC Articles 700, 701, 702

I. International Standards Organization ISO 9001: 2008

J. IEC 60947 – 6 – 1

PART 2 - PRODUCTS

2.1 MECHANICALLY HELD TRANSFER SWITCH

A. The transfer switch unit shall be electrically operated and mechanically held. The electrical operator shall be a single-solenoid mechanism, momentarily energized. Main operators which include over current disconnect devices will not be accepted. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency.

B. The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.

C. All main contacts shall be silver composition. Switches rated 800 amperes and above shall have segmented blow-on construction for high withstand current capability and be protected by separate arcing contacts.

D. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts when required.

E. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

F. Where neutral conductors must be switched, the ATS shall be provided with fully- rated neutral transfer contacts.

G. Where neutral conductors are to be solidly connected, a neutral terminal plate with fully-rated AL-CU pressure connectors shall be provided.

2.2 GROUP 'G' CONTROLLER WITH INTEGRATED USER INTERFACE PANEL

A. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance.

B. The controller shall direct the operation of the transfer switch. The controller's sensing and logic shall be controlled by a built-in microprocessor for maximum reliability, minimum maintenance, inherent serial communications capability, and the ability to communicate via the Ethernet through optional communications module.

C. A single controller shall provide single and three phase capability for maximum application flexibility and minimal spare part requirements. Voltage sensing shall be true RMS type and shall be accurate to ± 1% of nominal voltage. Frequency sensing shall be accurate to ± 0.1Hz. Time delay settings shall be accurate to ±0.5% of the full scale value of the time delay. The panel shall be capable of operating over a temperature range of -20 to + 70 degrees C, and storage from -55 to + 85 degrees C.

D. The controller shall be enclosed with a protective cover and be mounted separate from the transfer switch unit for safety and ease of maintenance. Sensing and control logic shall be provided on printed circuit boards.

E. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:

1. IEC 60947 – 6 – 1 Multiple Function Equipment Transfer Switching Equipment. 61000-4 Testing And Measurement Techniques – Overview.

    a. IEC 61000 – 4 - 2 Electrostatic Discharge Immunity

    b. IEC 61000 – 4 - 3 Radiated RF Field Immunity

c. IEC 61000 – 4 - 4 Electrical Fast Transient/Burst Immunity.

d. IEC 61000 – 4 - 5 Surge Immunity

e. IEC 61000 – 4 – 6 Conducted RF Immunity

2. CISPR 11 – Conducted RF Emissions and Radiated RF Emissions

2.3 ENCLOSURE

A. The 3ATS shall be provided with a Nema 1 enclosure suitable for wall or floor mounting.

2.4 CONTROLLER DISPLAY AND KEYPAD

A. A 128*64 graphical LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through communications port. The following parameters shall only be adjustable via DIP switches on the controller.

1. Nominal line voltage and frequency

2. Single or three phase sensing on normal

3. Transfer operating mode configuration, (open transition)

All instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals.

B. Voltage and Frequency Sensing

1. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup ,dropout, and trip settings capabilities (values shown as % of nominal unless otherwise specified.

Parameter	Sources	Dropout/Trip	Pickup/Reset
Undervoltage	N & E	70 to 98%	85 to 100%
Overvoltage	N & E	102 to 116%	2% below trip
Underfreqncy	N & E	85 to 98%	86 to 100%
Overfrequency	N & E	101 to 111%	2% below trip

2. Repetitive accuracy of all settings shall be within 1% at +25C

3. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via serial communications port access.

4. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage and frequency. *Note: Single phase sensing on emergency.*

5. The backlit 128*64 graphical display shall have multiple language capability. Languages can be selected from the user interface.

C. Time Delays

1. A time delay shall be provided to override momentary normal source outages and delay all transfer and engine starting signals, adjustable 0 to 6 seconds. It shall be possible to bypass the time delay from the controller user interface.

2. A time delay shall be provided on transfer to emergency, adjustable from 0 to 60 minutes 59 seconds for controlled timing of transfer of loads to emergency. It shall be possible to bypass the time delay from the controller user interface.

3. A generator stabilization time delay shall be provided after transfer to emergency adjustable 0 or 4 seconds.

4. A time delay shall be provided on retransfer to normal, adjustable 0 to 9 hours 59 minutes 59 seconds. Time delay shall be automatically bypassed if emergency source fails and normal source is acceptable.

5. A cooldown time delay shall be provided on shutdown of engine generator, Adjustable 0 to 60 minutes 59 seconds.

6. All adjustable time delays shall be field adjustable without the use of special tools.

7. A time delay activated output signal shall also be provided to drive an external relay(s) for selective load disconnect control. The controller shall have the ability to activate an adjustable 0 to 5 minutes 59 seconds time delay in any of the following modes:

   a. Prior to transfer only.

   b. Prior to and after transfer.

   c. Normal to emergency only.

   d. Emergency to normal only.

   e. Normal to emergency and emergency to normal.

   f. All transfer conditions or only when both sources are available.

8. In the event that the alternate source is not accepted within the configured Failure to Accept time delay, the common alert indication shall become active.

9. The controller shall also include the following built-in time delay for delayed transition operation.

10. A time delay for the load disconnect position for delayed transition operation adjustable 0 to 5 minutes 59 seconds.

2.5 ADDITIONAL FEATURES

A. The user interface shall be provided with test/reset modes. The test mode will simulate a normal source failure. The reset mode shall bypass the time delays on either transfer to emergency or retransfer to normal.

B. A set of contacts rated 5 amps, 30 VDC shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down. setting, regardless of whether the normal source restores before the load is transferred.

C. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the ATS is connected to the normal source and one contact closed when the ATS is connected to the emergency source.

D. A single alarm indication shall light up the alert indicator and de – energize the configured common alarm output relay for external monitoring.

E. LED indicating lights shall be provided; one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).

F. LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal (green) and emergency (red) source, as determined by the voltage sensing trip and reset settings for each source.

G. LED indicating light shall be provided to indicate switch not in automatic mode (manual); and blinking (amber) to indicate transfer inhibit.

H. LED indicating light shall be provided to indicate any alarm condition or active time delay (red).

I. Provide the ability to select “commit/no commit to transfer” to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.

J. A variable window inphase monitor shall be provided in the controller. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The inphase monitor shall be specifically designed for and be the product of the ATS manufacturer. The inphase monitor shall be equal to ASCO feature 27.

K. An engine generator exercising timer shall be provided to configure weekly and bi- weekly automatic testing of an engine generator set with or without load for 20 minutes fixed. It shall be capable of being configured to indicate a day of the week, and time weekly testing should occur.

L. Terminals shall be provided for a remote contact to signal the ATS to transfer to emergency. This inhibit signal can be enabled through the keypad or serial port.

M. System Status - The controller LCD display shall include a “System Status” screen which shall be readily accessible from any point in the menu by depressing the “ESC” key. This screen shall display a clear description of the active operating sequences and switch position. For example,

Normal Failed

Load on Normal

TD Normal to Emergency 2min 15s

Controllers that require multiple screens to determine system status or display “coded” system status messages, which must be explained by references in the operator’s manual are not permissible.

N. Self Diagnostics – The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.

O. Communications Interface – The controller shall be capable of interfacing, through an optional serial communication port with a network of transfer switches, locally (up to 4000 ft.). Standard software specific for transfer switch applications shall be available by the transfer switch manufacturer. This software shall allow for the monitoring, control, and setup of parameters.

P. Data Logging – The controller shall have the ability to log data and to maintain the last 99 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non – volatile memory.

1. Event Logging

    a. Data and time and reason for transfer normal to emergency

    b. Data and time and reason for transfer emergency to normal

    c. Data and time and reason for engine start

    d. Data and time engine stopped

    e. Data and time emergency source available

    f. Data and time emergency source not available

2. Statistical Data

    a. Total number of transfers

    b. Total number of transfers due to source failure

    c. Total number of day’s controller is energized

    d. Total number of hours both normal and emergency sources are Available

    e. Total time load is connected to normal

    f. Total time load is connected to emergency

    g. Last engine start

    h. Last engine start up time

    i. Input and output statuS

Q. Accessory Package - An accessory bundle shall be provided that includes:

1. A fully programmable engine exerciser with seven independent routines to exercise the engine generator, with or without load on a daily weekly, bi – weekly, or monthly basis.

2. Event log display that shows event number, time and date of events, event type, and reason (if applicable). A minimum of 300 events shall be stored.

3. RS – 485 communications port enabled.

4. Common alarm output contact.

R. Expansion Module - A relay expansion module (REX) is a standard feature when delayed transition transfer is specified. A REX module shall also be provided for open transition transfer that includes one form C contact for source availability of the normal (18G) and emergency (18B) sources. Additional output relay shall be provided to indicate a common alarm. The REX module shall have the capability of being daisy chained for multiple sets of contacts. (This feature shall be equal to ASCO accessory 18RX, and shall be capable of being added to existing switches without modification).

2.6 WITHSTAND AND CLOSING RATINGS

A. The ATS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the ATS terminals with the type of overcurrent protection shown on the plans. WCR ATS ratings shall be as follows when used with specific circuit breakers:

ATS Size	Withstand & Closing Rating MCCB (480v/60hz)	W/CLF
800 – 1200	65,000A (and 50kA Time-Based Rating)	200,000

PART 3 - EXECUTION

3.1 INSTALLATION

A. Check out transfer switch connections and operations and place in service.

B. Adjust control and sensing devices to achieve specified sequence of operation.

3.2 SERVICE REPRESENTATION

A. The manufacturer shall maintain a national service organization of employing personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.

B. The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.

C. For ease of maintenance, the transfer switch nameplate shall include drawing numbers and serviceable part numbers.

3.3 TRAINING

A. Demonstrate operation of transfer switch in normal, and emergency modes.

B. Furnish 4 hours of instruction each for two persons, to be conducted at project site with manufacturer's representative.

3.4 TESTS AND CERTIFICATION

A. The complete 3ATS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements.

B. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards, and withstand and closing ratings. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.

C. The ATS manufacturer shall be certified to ISO 9001: 2008 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001: 2008.

END OF SECTION

SECTION 27 05 23

AUDIO-VIDEO SIGNAL DISTRIBUTION SYSTEM

PART 1 GENERAL

1.01 SCOPE OF WORK:

A. All applicable portions of Division 26 shall apply to this section as though written herein completely.

B. Provide a complete and operable audio-video signal distribution system including, but not limited to, wall-taps, splitters, amplifiers, wall-plates, pass-thru connectors, back-boxes, wiring, terminations and required programming to meet the Owner's criteria. The distribution system shall furnish signals to audio-video outlets shown on plan. The system shall pass all channels without noticeable degradation of intelligence of color fidelity, suitable for the proper connection of standard EIA audio-video receivers and shall deliver a minimum of 10dbmV signal strength to each receiver on every audio-video channel in the system; this condition shall be met when every outlet is connected to a lead. Zero dbmV equals 1,000 microvolts across 75 Ohms.

C. The work under this section includes all labor, materials, equipment, and accessories required to furnish and install complete systems functioning in compliance with the manufacturer's specifications and the Fire Department requirements.

1.02 RELATED WORK:

Document affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and sections of Divisions 1 and 26 of these specifications.

A. The work described by this part includes the furnishing of all materials, equipment, supplies, labor and the performing of all operations necessary for the installation of complete and operating systems.

B. All conduits, outlet boxes, back boxes, junction boxes, terminal cabinets, backboards, wiring, cables, equipment, devices, etc., shall be furnished and installed complete under this section. Conduit and junction box sizes shall be determined by the audio-video system contractor for the particular wire and cable fills required for the systems installed. (Conduit sizes shall comply with the California Electrical Code). The entire responsibility of the system, including the installation, operation, function, testing and maintenance for one (1) year after final acceptance under this section shall be the responsibility of the audio-video system contractor.

C. The audio-video system contractor shall furnish and install all equipment, cables, devices, and other materials even though not specifically mentioned herein, which are necessary for the proper integration of the system so that the system shall perform the functions listed herein in compliance with all specified requirements.

1.03 GENERAL REQUIREMENTS

A. The audio-video system contractor shall hold a valid State of California C-7 License, shall have completed at least 20 projects of equal scope, shall have been in business of furnishing and installing communication systems of this type for at least five years, and capable of being bonded to assure the owner of performance and satisfactory service during the guarantee period.

B. The audio-video system contractor shall provide a letter with submittals from the manufacturer of the system, or the major components of the system, to the Fire Department stating that the audio-video system contractor is a certified representative and that manufacturer has a service representative assigned to provide repair and mitigation to the system(s) within a 24 hour time period.

C. The audio-video system contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work.

D. The audio-video system contractor shall be a factory authorized distributor and warrantee station for the brand of equipment specified and shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The audio-video system contractor shall maintain a spare set of all major parts for the system at all times. Refer to Section 27 05 23, Part 2, item 2.01 for major parts list. All system components shall be 100% backed up with stock at contractor's shop.

1.04 QUALITY ASSURANCE:

A. It is the intent of these specifications to establish a standard of quality for labor and material to be installed. The Base Bid shall include materials as specified without exception. For any proposed substitution, complete descriptive, technical and cost comparison data and test reports shall be submitted for review during the bidding period. The Contractor shall reimburse the Architect for any additional engineering charges and shall pay all charges of other trades resulting from substitutions. Proposed substitutions shall be listed on the bid form, stating the reasons for substitution and the amount to be deducted from the bid if the substitution is allowed. Final approval of the alternate system shall be determined at the time of job completion. Failure to provide the "precise functional equivalent" shall result in the removal of the alternate system and installation of the specified system at the contractor's expense.

B. If a substitution item is given final acceptance by the Owner, the contractor shall pay all costs (including travel, lodging, meals, computers, etc….) required to provide factory certification, equal to that of a Factory Authorized Distributor of the substituted item, for two (2) selected Owners representatives. This training shall occur at the primary factory of the substituted item in question and shall allow the selected Owners representatives to provide any and all Factory / Manufacturer approved repairs, services, software upgrades, etc… without affecting any available or applicable Manufacturer Warranties.

C. All of the audio-video system equipment shall be furnished and installed by the Authorized Factory Distributor of the equipment. The Contractor shall furnish a letter from the manufacturer of all major equipment, which certifies that the audio-video system contractor is the Authorized Distributor and that the equipment has been installed according to factory intended practices. The Contractor shall also furnish a written guarantee from the manufacturer that they will have a service representative assigned to this area for the life of the equipment.

D. All audio-video system components supplied shall be listed by Underwriter's Laboratories. A copy of the UL listing card for the proposed system shall be included with the contractor's submittal.

E. The material in this section will be covered by a five year material warranty policy.

1.05 SUBMITTAL AND MANUALS

A. Comply with all requirements of the General Conditions, Supplementary Conditions and applicable sections of Divisions 1 and 16 of these specifications.

B. Additional requirements of this section are:

1. Within thirty-five (35) calendar days after the date of award of the Contract, the Contractor shall submit to the Architect for review, eight copies of a complete submission.

2. The submission shall consist of five major sections with each section separated with index tabs. Each page in the submission shall be numbered chronologically and shall be summarized in the index.

3. The first section shall be the "Index" which shall include the project title and address, name of the firm submitting the proposal and name of the Architect.

4. The second section shall include a copy of the AUDIO-VIDEO system contractor valid C-7 California State Contractors License, letters of factory authorization and guaranteed service, list of 20 projects of equal scope and list of proposed instrumentation to be used by the Contractor.

5. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished next to all of the specified equipment's features and functions as stated in the specifications and data sheets.

6. The fourth section shall contain an original factory data sheet for every piece of equipment in the specifications.

7. The fifth section shall contain a wiring designation schedule for each circuit leaving each piece of equipment and drawings showing system wiring plans.

8. The submittal shall also include, but not be limited to, floor plans indicating location of equipment, system devices, single line diagram, required wire/cable between equipment and devices, wiring/connection diagrams and a written description of the system operation and functions.

C. The Contractor shall provide two copies of an "Operating and Servicing Manual" for the system. The manuals shall be bound in flexible binders. All data shall be printed material or typewritten. Each manual shall include the following: Instructions necessary for the proper operation and servicing of the system; complete as-built installation drawings of the system; a wiring destination schedule for each circuit leaving for each piece of equipment.

PART 2 - PRODUCTS

2.01 AUDIO-VIDEO SIGNAL DISTRIBUTION

A. Room taps: Blonder-Tongue #V-3889 with isolation as required.

B. Amplifier: Blonder-Tongue #Bida RMDA550-50, rack mounted, with filters and return amp modules as required. Furnish minimum of one (1) at each terminal backboard.

C. Terminators:

1. Blonder-Tongue #BTFTP and splitters CRS-2 or 4 as required.

2. HDMI pass thru connectors and HDMI splitter.

D. Wire/cable:

1. RG6 Coax cable.

2. Cat 6 UTP cable.

3. HDMI cable.

E. System, including wire/cable, shall be provided, installed and terminated by the audio-video system contractor.

F. Unless otherwise noted on plan. Provide the following A-V outlets at TV locations:

1. Dorm Rooms: Combination coax and RJ45 wall plate.

2. Offices: Combination coax and RJ45 wall plate.

3. Dining: Combination coax and RJ45 wall plate.

4. Conference:

    a. At TV: One (1) Combination coax and RJ45 wall plate, and one (1) two-HDMI wall plate for user input from wall and floor outlets.

    b. On wall above counter top (+42”): HDMI wall plate for user input.

    c. Flush floor: HDMI wall plate for user input.

5. Exercise room:

    a. At TV: One (1) Combination coax, RJ45, and HDMI (user input) wall plate.

    b. On wall (+15”): HDMI wall plate for user input.

6. Day Room:

    a. At TV: One (1) Combination coax and RJ45 wall plate, and one (1) two-HDMI wall plate for user inputs from wall.

    b. On wall above counter top (+42”): HDMI wall plate for user input.

    c. On wall in casework (+15”): HDMI wall plate for user input.

G. Refer to plan drawings for wall plates and cabling required for “A/V” (Audio-Video) outlets indicated on plan.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Terminate a dedicated Cat 6 data cable and RG6 coax cable at each dorm room, office and dining room TV outlet. Home-run the Cat 6 cable from each TV outlet to the MDF and the RG6 cable from each TV outlet to the TV head-end equipment in the Data room. Refer to Section 27 17 43 for the Cat 6 cable requirements.

B. Conference Room: Terminate a dedicated Cat 6 data cable and RG6 coax cable at the TV. Home-run the Cat 6 cable from each TV outlet to the MDF. Home-run the RG6 cable from each TV outlet to the TV head-end equipment in the Data room. Run the HDMI cable from the wall mounted HDMI connector to the HDMI connector at the TV. Run the HDMI cable from the flush floor mounted HDMI connector to the HDMI connector at the TV. Refer to Section 27 17 43 for the Cat 6 cable requirements.

C. Exercise Room: Terminate a dedicated Cat 6 data cable and RG6 coax cable at the TV. Home-run the Cat 6 cable from each TV outlet to the MDF. Home-run the RG6 cable from each TV outlet to the TV head-end equipment in the Data room. Run the HDMI cable from the wall mounted HDMI connector to the HDMI connector at the TV. Refer to Section 27 17 43 for the Cat 6 cable requirements

D. Day Room: Terminate a dedicated Cat 6 data cable and RG6 coax cable at the TV. Home-run the Cat 6 cable from each TV outlet to the MDF. Home-run the RG6 cable from each TV outlet to the TV head-end equipment in the Data room. Run the HDMI cable from the counter top wall mounted HDMI connector to the HDMI connector at the TV. Run the HDMI cable from the casework wall mounted HDMI connector to the HDMI connector at the TV. Refer to Section 27 17 43 for the Cat 6 cable requirements.

E. The wiring of the system shall be executed in accordance with the drawings and the equipment manufacturer's wiring diagrams. Should any variations in these requirements occur, the contractor shall notify the architect before making any changes. It shall be the responsibility of the factory authorized distributor of the specified equipment to install the equipment and guarantee the system to operate as per plans and specifications.

F. Furnish all conductors, equipment plugs, terminal strips, etc., and labor to install a complete and operable system.

G. The cables within the rack or cabinets shall be carefully cabled using ty-raps. All cables shall be numbered for identification.

H. Splices of conductors in underground pull boxes is not permitted.

I. The labor employed by the contractor shall be regularly employed in the installation and repair of communication systems and shall be acceptable to the owner and architect to engage in the installation and service of this system.

J. The contractor shall thoroughly clean all equipment and materials. All exposed parts of the equipment, cabinets, and other equipment shall be left in a clean condition, unblemished and free of all dirt, dust, smudges, spots, fingerprints, etc., The contractor shall remove all debris and rubbish occasioned by the electronic systems work from the site. The contractor shall thoroughly clean all buildings of any dirt, debris, rubbish, marks, etc., Caused by the performance of this work.

K. The contractor shall provide not less than eight (8) hours for instruction of personnel in the operation and maintenance of the systems. This instruction time shall be divided as directed by the Owner.

L. All outlets and unused taps shall be furnished with an “F” connector with a 75ohm terminating resistor.

M. All TV outlets shall be furnished with a terminated 6’-0” RG6, HDMI and Cat 6 patch cable/cord for the Owner’s use.

N. The contractor shall be responsible for reviewing the plans and specifications to ensure each room, where TV signal distribution system equipment is to be installed, has sufficient space to accommodate the system cabinets, equipment and terminations while maintaining code mandated clearances about said equipment. The contractor shall identify problem areas prior to bid, include all costs required for corrective measures in his bid and submit alternate equipment and materials suitable for the installation to the Architect/Engineer for acceptance as part of the product submittal process

3.02 WARRANTY

A. The entire system shall be warranted free of mechanical or electrical defects for a period of one (1) year after final acceptance of the installation. Any material showing mechanical or electrical defects shall be replaced promptly at no expense to the purchaser.

B. The contractor shall maintain a competent service organization and shall, if requested, submit a service maintenance agreement to the owner after the end of the guarantee period.

C. A typewritten notice shall be posted at the equipment rack which shall indicate the firm, address and telephone number to call when service is necessary. The notice shall be mounted in a neatly finished metal frame with a clear plastic window and securely attached to the inside of the door.

3.03 TESTING

A. Provide all instruments for testing and demonstrating in the presence of the owner's inspector that the frequency response is as stated in the factory data sheets. Check all circuits and wiring to verify they are free of shorts and grounds. Perform all tests stated of the TV outlets. Document the dB of channel 2 and channel 54. The system and all outlets shall be adjusted for a minimum of 15dB on both reference channels. The A/V reference for all documented tests are to be performed with NTSC color bar pattern and pink noise audio generated on both frequencies. The difference between channel 2 and channel 54 shall not exceed 3dB at any TV outlet.

B. The owner reserves the right to make independent tests of all equipment furnished to determine whether or not the equipment complies with the requirements specified herein and to accept or reject any or all of the equipment on the basis of the results thereby obtained.

C. Upon activation of the City furnished local CATV feed for the station, the contractor awarded this section shall provide connection and balancing of the system.

D. Written test reports are to be provided by the installing contractor to indicate the channel 2 and 54 test reports by outlet location and the time of the verification test with the inspector of record.

END OF SECTION

SECTION 27 13 43

DATA NETWORK AND NETWORK WIRE/CABLING SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. All applicable portions of Section 26 shall apply to this section as though written herein completely.

B. The work under this section includes all labor, materials, equipment, and accessories required to furnish and install a complete Network and Network Wire and Cabling System as indicated on the drawings and as specified herein.

C. The scope of work includes routing Cat 6 cables from the MDF in the Data room to the station outlets. All work shall be coordinated with the City/Fire Department IT Department.

D. All network wire/cable shall be new, provided, installed and terminated under this contract.

1.2 RELATED WORK

Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and sections of Divisions 1 and 26 of these specifications.

A. The work described by this part includes the furnishing of all materials, equipment, supplies, labor and the performing of all operations necessary for the installation of complete and operating systems.

B. All conduits, outlet boxes, back boxes, junction boxes, terminal cabinets, backboards, etc., shall be furnished and installed by the Division 26 contractor under the direction of the Communications Contractor. Conduit and junction box sizes shall be determined by the Installing Communications Contractor for the particular wire and cable fills required for the systems installed. (Conduit sizes shall comply with the California Electrical Code). The entire responsibility of the system, including the installation, operation, function, testing and maintenance for one (1) year after final acceptance under this section shall be the responsibility of the Communications Contractor.

C. The Installing Communications Contractor shall furnish and install all equipment, cables, devices, and other materials even though not specifically mentioned herein, which are necessary for the proper integration of the system so that the system shall perform the functions listed herein in compliance with all specified requirements.

1.3 GENERAL REQUIREMENTS

A. The installing Communications Contractor shall hold a valid State of California C-7 License, shall have completed at least 20 projects of equal scope, shall have been in business of furnishing and installing communication systems of this type for at least five years, and capable of being bonded to assure the owner of performance and satisfactory service during the guarantee period.

B. The installing Communications Contractor shall be a factory authorized distributor and warrantee station for the brand of equipment offered and shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The Installing Communication Contractor shall maintain a spare set of all major parts for the system at all times. Refer to Section 27 13 43, Part 2, Item 2.1F for list of major parts. All circuit boards and control sub systems shall be 100% backed up with stock at contractors' shop.

C. Installing contractor shall be a Commscope Uniprise certified installer, or approved equal Belden IBDN, Legrand LCS3, Panduit Certification Plus or Leviton/Berk-Tek, and shall provide a 25 years application warranty. All products provided and installed by the certified installer shall be of the type and manufacturer required to meet the warranty criteria.

1.4 SUBMITTAL AND MANUALS

A. Comply with all requirements of the General Conditions, Supplementary Conditions and applicable sections of Divisions 1 and 26 of these specifications.

B. Additional requirements of this section are:

1. Within thirty-five (35) calendar days after the date of award of the Contract, the Contractor shall submit to the Architect for review, eight copies of a complete submission.

2. The submission shall consist of five major sections with each section separated with index tabs. Each page in the submission shall be numbered chronologically and shall be summarized in the index.

3. The first section shall be the "Index" which shall include the project title and address, name of the firm submitting the proposal and name of the Architect.

4. The second section shall include a copy of the Installing Communication Contractors valid C-7 California State Contractors License, letters of factory authorization and guaranteed service, list of 20 projects of equal scope and list of proposed instrumentation to be used by the Contractor.

5. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished next to all of the specified equipment's features and functions as stated in the specifications and data sheets.

6. The fourth section shall contain an original factory data sheet for every piece of equipment in the specifications.

7. The submittal shall also include, but not be limited to, floor plans indicating location of equipment, system devices, outlets with cable addresses, block/riser diagram, equipment rack elevation drawing indicating the placement of all rack mounted equipment, wall-plate drawing for each outlet configuration (i.e. wall plate with two RJ45 connectors), required wire/cable between equipment and devices, wiring/connection diagrams and a written description of the system operation and functions.

C. Submittals that include equipment data sheets but no plan drawings and site specific wiring diagrams shall be considered incomplete, will not be reviewed, and shall be returned to the Contractor for re-submittal.

D. The Contractor shall provide two copies of an "Operating and Servicing Manual" for the system. The manuals shall be bound in flexible binders. All data shall be printed material or typewritten. Each manual shall include the following: Instructions necessary for the proper operation and servicing of the system; complete as-built installation drawings of the system; a schematic diagram of major components with all transistor and IC complements and replacement number.

PART 2 - EQUIPMENT

2.1 NETWORK WIRE AND CABLE SYSTEM

A. Provide all necessary labor, equipment and materials for a complete system.

B. Copper Wire Cable (unshielded twisted pairs):

1. Provide Category 6 (4 pair) cables from each data system outlet indicated on the drawings to the patch panel at the MDF.

2. Provide Category 6A (4 pair) cables from each wireless access point (WAP) outlet indicated on the drawings to the patch panel at the MDF.

3. Provide Category 6 (4 pair) cable from the door access control panel to the patch panel at the MDF.

4. Category 6 and 6A cables shall be copper wire, 600 MHz, individually insulated and color coded, with an overall non-conductive jacket as manufactured by General Cable and meet EIA/TIA 568B wiring standard.

5. Category 6 Data cables shall have a “blue” colored outer jacket.

6. Category 6A Data (WAP) cables shall have a “gray” colored outer jacket.

7. Category 6 Voice/Telephone cables shall have a “white” colored outer jacket.

8. Category 6 Data cable for the door access system shall have a “blue” colored outer jacket.

9. All cables installed underground will be duct rated for that use.

D. System Outlets

1. Unless noted otherwise on plan, each Data outlet indicated on plan shall be cabled with two (2) 4-pair, category 6, 24 AWG cable, terminating on RJ45 jacks equipped with 110 type terminations, and on the data category 6 patch panels, using 110 type hardware as shown in the drawings. Data terminations will be allocated to specific termination areas and use colored designation strips.

2. Unless noted otherwise on plan, each wireless access point indicated on plan shall be cabled with two (2) 4-pair, category 6A, 24 AWG cable, terminating on RJ45 jacks equipped with 110 type terminations, and on the data category 6 patch panels, using 110 type hardware as shown in the drawings. Data terminations will be allocated to specific termination areas and use colored designation strips.

3. Unless noted otherwise on plan, each combination Voice/Data outlet indicated on plan shall be cabled with three (3) 4-pair, category 6, 24 AWG cables. Voice/Data cables shall terminate on RJ45 jacks equipped with 110 type terminations, and on the data category 6 patch panels, using 110 type hardware as shown in the drawings. Voice/Data terminations will be allocated to specific termination areas and use colored designation strips.

4. Unless noted otherwise on plan, each Voice outlet indicated on plan shall be cabled with one (1) 4-pair, category 6, 24 AWG cable, terminating on RJ45 jacks equipped with 110 type terminations, and on the data category 6 patch panels, using 110 type hardware as shown in the drawings. Voice terminations will be allocated to specific termination areas and use colored designation strips.

5. Provide faceplates with RJ45 connectors and blanks as required.

6. Inserts for data/computer network applications shall be “blue”.

7. Inserts for WAP network applications shall be “grey”.

8. Inserts for voce/telephone applications shall be “white”.

9. Inserts for door access control application shall be “blue”.

10. Provide “white” covers for blanks/spaces.

E. Provide the following equipment racks and networking distribution equipment in the Data room indicated on plan:

1. MDF rack – Two (2) 2-post 86”H floor mount enclosures, with vertical cabling sections, shelves, power strip, cable management system, and 3000VA, 208V. 1 phase rack mounted-UPS. The equipment enclosures shall house all network equipment, telephone head-end equipment and VoIP system components. Tripp-Lite SmartRack 45U Heavy-Duty 2-Post Open Frame Rack, 12" deep Model #SR2POSTDP12HD.

2. Minimum rack mounted network distribution equipment to be installed in the rack shall include, but not be limited to, patch panels, Cat 6 modular jacks (blue, gray, white and yellow). Quantity to be determined by the quantity of cables to be terminated in the rack plus 20% spare.

3. Provide patch panels as required to terminate all Cat 6 and Cat 6A cables indicated on plans plus 20% spare.

    a. Patch panels shall be category 6 and 6A, 48-port patch panels (loaded) and consist of the panel, wiring blocks, rack mount strain relief bar, and port modules.

    b. Patch panel shall mount to TIA-EIA complaint 19" rack mount bracket. Patch panel shall utilize standards compliant RJ45 jacks for station cable termination.

    c. Jacks or insert shall be RJ45, 6-port modules with individually replaceable jacks in accordance with TIA/EIA 568B wiring standard, FCC Part 68, UL Listed, NEC Article 800. It shall accommodate 110-type jack of the 4 pair category 6 cable and category 6A. Jack shall support gigabit ethernet, 100 Base-T, 10 Base-T and analog connections.

    d. Backside strain relief shall be provided for every row of ports. It shall be attached to the TIA/EIA compliant rack via rear mounting holes.

4. Provide a Category 6 and 6A patch cord, depending on system served, for each position in use plus 20% spare.

5. Universal cable runway – Provide with rack to runway mounting plate and required hardware.

    a. MDF components that are part of the structured wiring solution shall be covered by the 25 year application warranty.

F. Copper Wire Cable Installation:

1. Wire/cables connecting to equipment racks shall be installed with not less than 10 feet of slack cable between the rack and terminal backboard. The slack cable shall be coiled in the light box.

2. Provide 18 inches of cable slack at computer data system outlets.

3. The minimum bending radius for all cables and the maximum pulling tension shall not exceed manufacturer's recommendations.

4. Cables installed in pull boxes on terminal backboards shall be installed on wall mounted cable support racks.

5. Provide a full 360 degree loop of cable around pull box interiors.

6. Cable pulling shall use a split mesh grip over the cable jacket connection directly to copper conductors shall not occur.

7. A dynameter to measure pulling tension shall be used on all cable runs in excess of 200 feet or more with 180 degrees in bends. The actual pulling tension value shall be calculated and recorded for each pull.

8. Pulling eyes on copper conductor shall not be used.

9. Cable pulling lubricants shall be continuously applied to all cables and be specifically approved by the cable manufacturer

10. Where cables are "pulled through" or pulled from a "center of run pull" without splices or terminations lead out the cables at pull boxes and conduits taking care to feed them in again by hand for the next run.

11. For each cable pull where a cable direction changes is required, flexible feed-in tubes, pullout devices, multi-segmented sheaves, etc. shall be used to insure proper cable pulling tensions and side wall pressures. Cables shall not be pulled directly around a short right angle bend. Any device or surface the cable comes in contact with when under pull-in tension shall have a minimum radius 50% greater than the final specified minimum installed cable bending radius.

12. Separation of individual twisted pair to be no more than .5" from termination point.

G. Data room terminal equipment ground bus (TEGB) - Provide a wall mounted TEGB ground bus at each location where computer networking equipment is provided. The TEGB ground bus shall be copper 1/4 inch x 2 inch (nominal) x 12 inches long (minimum). Install the TEGB on the wall with a minimum of two "stand-off" electrical insulators. Drill and tap the ground bus and provide bolted type ground lugs for connection of ground conductors size #10 AWG - #1 AWG. Provide (4) spare unused ground lugs on the TEGB. Provide 1 1/4 inch conduit with 1 #2 AWG copper insulated ground conductor from the TEGB to the building main ground reference bus

H. Splicing of cables or conductors is not permitted.

I. All cables, outlets and terminations shall be labeled and designated in accordance with the City/Fire Department I.T. Department standards. Contractor shall confirm labeling scheme with the City/Fire Department in advance.

J. The labor employed by the contractor shall be regularly employed in the installation and repair of communication systems and shall be acceptable to the owner and architect to engage in the installation and service of this system.

K. Each individual copper wire/conductor in all terminated and unterminated cables provided in the contract shall be tested after installation. Testing shall be done by an independent testing laboratory.

L. Upon completion of above tests Contractor is to submit a report presenting test results for all measurements. With the report, submit written certification that the installation conforms to specifications. Provide data on memory sticks in Microtest format.

M. Test Parameters:

1. Category 6 cables shall be tested to meet EIA/TIA 568-B.1 and 568-B.2, 250 MHz performance specifications and for continuity, opens, breaks, shorts, and grounds, near end cross-talk, impedance, capacitance, and resistance.

2. UTP cable not meeting EIA Category 6 and 250 MHz specifications shall be replaced by the Contractor at no charge to the contract.

3. Cables shall be tested up to 600 MHz.

N. LAN Electronics for Data Network: Provided and installed by the City/Fire Department I.T. Department.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The wiring of the system shall be executed in accordance with the drawings and the equipment manufacturer's wiring diagrams. Should any variations in these requirements occur, the contractor shall notify the architect before making any changes. It shall be the responsibility of the factory authorized distributor of the approved equipment to install the equipment and guarantee the system to operate as per plans and specifications.

B. Furnish all conductors, equipment plugs, terminal strips, etc., And labor to install a complete and operable system.

C. The cables within the rack or cabinets shall be carefully cabled and laced with T&B model ty-rap series 500 cable straps. All cables numbered for identification.

D. Splicing of conductors is not permitted.

E. Maximum distance for UTP cable is 300 feet. Contractor shall verify distances between the MDF and the system outlets after the installation of the raceways/conduits and back boxes is complete. Where distances exceed 250 feet the contractor shall provide an intermediate distribution frame (IDF) to serve the affected outlets.

F. The labor employed by the contractor shall be regularly employed in the installation and repair of communication systems and shall be acceptable to the owner and architect to engage in the installation and service of this system.

G. The contractor shall thoroughly clean all equipment and materials. All exposed parts of the equipment, cabinets, and other equipment shall be left in a clean condition, unblemished and free of all dirt, dust, smudges, spots, fingerprints, etc., The contractor shall remove all debris and rubbish occasioned by the electronic systems work from the site. The contractor shall thoroughly clean all buildings of any dirt, debris, rubbish, marks, etc., Caused by the performance of this work.

H. The contractor shall provide not less than eight (8) hours for instruction of personnel in the operation and maintenance of the systems. This instruction time shall be divided a directed by the Owner.

I. The contractor shall be responsible for reviewing the plans and specifications to ensure each room, where data network equipment is to be installed, has sufficient space to accommodate the system cabinets, equipment and terminations while maintaining code mandated clearances about said equipment. The contractor shall identify problem areas prior to bid, include all costs required for corrective measures in his bid and submit alternate equipment and materials suitable for the installation to the Architect/Engineer for acceptance as part of the product submittal process.

3.2 WARRANTY

A. The entire system shall be warranted free of mechanical or electrical defects for a period of one (1) year after final acceptance of the installation. Any material showing mechanical or electrical defects shall be replaced promptly at no expense to the purchaser.

B. The contractor shall maintain a competent service organization and shall, if requested, submit a service maintenance agreement to the owner after the end of the guarantee period.

C. A typewritten notice shall be posted at the equipment rack which shall indicate the firm, address and telephone number to call when service is necessary. The notice shall be mounted in a neatly finished metal frame with a clear plastic window and securely attached to the inside of the door.

D. Submit 25 years warranty of the structured wiring solution.

3.3 TESTING

A. Provide all instruments for testing and demonstrating in the presence of the owner's inspector that the frequency response is as stated in the factory data sheets. Check all circuits and wiring to verify they are free of shorts and grounds. Perform all tests stated in each separate system specification.

B. The owner reserves the right to make independent tests of all equipment furnished to determine whether or not the equipment complies with the requirements specified herein and to accept or reject any or all of the equipment on the basis of the results thereby obtained.

3.4 RECORD DRAWINGS

A. Submit as-built drawings of the structured cabling in PDF format and AutoCAD format.

END OF SECTION

SECTION 27 51 30

FIRE STATION ALERTING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Furnish and install the Fire Station Alerting System Infrastructure and all applicable appurtenances as herein specified and as shown on the applicable drawings. The purpose of this document is to provide a reference for the Contractor to implement the necessary features for the installation of the Fire Station Alerting System (FSAS) equipment.

B. The FSAS system equipment shall be provided and installed by the FSAS contractor.

C. Conduit/raceways shall be provided and installed by the Electrical Contractor.

D. Standard back-boxes shall be provided and installed by the Electrical Contractor. Specialty back-boxes shall be furnished by the FSAS Contractor and installed by the Electrical Contractor. Refer to the FSAS drawings for back-boxes to be provided by the Eelctrical Contractor.

E. FSAS wire/cable shall be furnished by the FSAS contractor and installed by the electrical contractor.

F. The electrical contractor shall patch, repair and refinish walls, ceilings or floors disturbed by the installation of conduit and back boxes.

G. All work shall be coordinated and in compliance with the FSAS installing contractor requirements.

H. Final location and quantity of FSAS equipment and back-boxes shall be per the FSAS equipment plans. The contractor shall obtain a copy of the FSAS equipment drawings prior to rough-in.

I. Provide 120V. dedicated circuits for FSAS control panels and miscellaneous equipment requiring 120V. power as indicated on the FSAS drawings.

J. The electrical contractor shall notify the Architect/Engineer wherever a discrepancy in quantity or size of conduit, wire, equipment, devices, back-boxes, etc., (all materials), arises between the plans and and the FSAS equipment plans. The electrical contractor shall obtain direction from the Architect/Engineer prior to proceeding with the work.

K. All requiremets of Section 260000 shall apply to this section.

L. General Information:

1. All conduits shall be sized per the California Electrical Code and shall be provided with pullstrings.

2. The alerting speakers are intended to function independent of any other system. Speaker backboxes are to be furnished by the alerting system vendor and Contractor installed.

3. Standard 4” square and 4 11/16” square wall mounted equipment back boxes shall be provided and installed by the Contractor.

4. Specialty/custom back-boxes shall be furnished by the FSAS contractor and installed by the electrical contractor.

5. Radio, Antenna’s and Mast shall be provided and installed by the FSAS contractor.

6. Electrical contractor to provide a 2” conduit from the alerting system head-end equipment to the roof at the antenna indicated on the FSAS equipment plan.

7. Contractor shall provide a 600 ohm analog audio connection from the telephone system to the Fire Station Alerting system. Provide required cabling to connect the alerting system and the telephone switch.

M. Submittals:

1. Comply with all requirements of the General Conditions, Supplementary Conditions and applicable sections of Divisions 1 and 26 of these specifications.

2. Additional requirements of this section are:

a. Within thirty-five (35) calendar days after the date of award of the Contract, the Contractor shall submit to the Architect for review, eight copies of a complete submission.

b. The submission shall consist of five major sections with each section separated with index tabs. Each page in the submission shall be numbered chronologically and shall be summarized in the index.

c. The first section shall be the "Index" which shall include the project title and address, name of the firm submitting the proposal and name of the Architect.

d. The second section shall include a copy of the Installing Communication Contractors valid C-10 California State Contractors License, letters of factory authorization and guaranteed service, list of 20 projects of equal scope and list of proposed instrumentation to be used by the Contractor.

e. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished next to all of the specified equipment's features and functions as stated in the specifications and data sheets.

f. The fourth section shall contain an original factory data sheet for every piece of equipment in the specifications.

g. The fifth section shall contain a wiring designation schedule for each circuit leaving each piece of equipment and drawings showing system wiring plans.

h. The submittal shall also include, but not be limited to, floor plans indicating location of equipment, system devices, block diagram, required wire/cable between equipment and devices, wiring/connection diagrams and a written description of the system operation and functions.

PART 2 - PRODUCTS

2.01 CONDUIT:

1. Intermediate Metal Conduit (IMC), shall be hot-dipped galvanized in accordance with UL 1242 and meeting Federal Specification WWC-581 (latest revision).

2. Electrical Metallic Tubing (EMT), shall be zinc-coated steel with baked enamel or plastic finish on inside surfaces.

3. Flexible metal conduit shall be constructed of aluminum or hot-dipped galvanized steel strips wound spirally with interlocking edges to provide greatest flexibility with maximum strength. Interior surfaces shall be smooth and offer minimum drag to pulling in conductors. Used only as directed by the Engineer.

4. Liquid-tight conduit (Seal-Tite) shall be galvanized steel flexible conduit as above except with moisture and oil-proof jacket, pre-cut lengths and factory installed fittings. For outdoor installations and final connection to speakers.

5. Non-Metallic Conduit:

    a. Polyvinyl chloride (PVC) rigid conduit, Schedule 40, Type II for underground installation only.

    b. Conduit and fitting shall be produced by the same manufacturer.

6. Electrical non-metallic tubing (ENT) is not permitted.

2.02 CONDUIT FITTINGS:

1. Connector, coupling, locknut, bushings and caps used with rigid conduit shall be steel, threaded and thoroughly galvanized. Bushings shall be insulated.

2. EMT fittings, connectors and couplings, shall be steel, zinc or cadmium plated, raintight, threadless, compression or tap-on multiple point, steel locking ring type with insulated throat.

3. Flexible steel conduit connectors shall be malleable iron clamp or squeeze type or steel twist-in type with insulated throat. The finish shall be zinc or cadmium plating.

4. Die cast, set screw or indenter type fittings are not acceptable.

2.03 OUTLET BOXES

1. For 120V. circuits, outlet boxes shall be 4” square x 2 1/8” deep, steel, knockout type, mounted flush with in wall. Provide with plaster rings and wall plate.

2. For FSAS devices, outlet boxes shall be 4 11/16” square x 2 1/8” deep, steel, knockout type, mounted flush with in wall. Provided with plaster rings and leave outlet box ready for installation of Owner furnished wall plate.

3. FSAS specialty/custom boxes shall be furnished by the FSAS contractor and installed by the electrical contractor. Boxes shall be mounted flush with wall unless otherwise noted on the FSAS equipment drawings.

4. For wet or damp locations, outlet boxes shall be heavy cast aluminum or cast iron with threaded hubs; covers shall be watertight with gaskets and non-ferrous screws.

2.04 WIRE / CABLE:

1. For 120V. circuits, provide type THHN/THWN thermoplastic, 600 volt, UL approved, dry and wet locations. Refer to Section 260000 for wire requirements.

2. For FSAS communications cable, provided by the FSAS system vendor, installed by the contractor.

3. Wire and cable shall be new, manufactured not more than six (6) months prior to installation, shall have size, type of insulation, voltage rating and manufacturer's name permanently marked on outer covering at regular intervals.

4. No conductors carrying 120 volt or more shall be smaller than #12 AWG.

2.05 CABLE TRAY (MDF / IDF ROOMS):

1. Comm Room: Cable tray shall be aluminum tray or corrugated ventilated trays. Tray shall be at least 18 inches wide and 2 inches deep.

2. Cable racking: Use reusable Velcro cable managers (cable ties) to create a neat and orderly appearance and practical installation.

3. Cable tray shall be secured on 10-foot centers using single center mounted steel supporting rods and bottom “T” connector, angle wall supports, or a standard trapeze type support system.

4. Cable tray shall be grounded and bonded end to end.

5. Cable tray shall not be placed within 5 inches of any overhead light fixture and within 12 inches of any electrical ballast.

6. A minimum clearance of 8 inches above the cable tray must be maintained at all times.

2.06 TELEPHONE SYSTEM COORDINATION:

1. Provide interface between the stations’s telephone switch and the FSAS controller to allow the phone system to page over the alerting system speakers.

2. Coordinate requirements with the FSAS contractor.

PART 3 - EXECUTION

3.01 WIRE/CABLE:

A. Homerun cables from the equipment/devices indicated on plan to the Communications Room (FSAS control panel/controller).

B. A minimum of 3ft cable length or 4ft cable loop at each device location for final termination.

C. Cabling shall be installed in raceways, supported by j-hooks or other approved support systems and terminated at station locations indicated.

D. Cabling shall be of a “Universal Cabling Plan” where station cables are wired directly as indicated on plans.

E. Cables not installed in conduit or wireways shall be properly secured and neat in appearance. Under no circumstances shall any cabling or support systems lie on or attach to the drop ceiling. All cabling shall be supported at least 12” above the drop ceiling.

F. Where accessible ceilings are non-existent, cables shall be run in conduit concealed in walls, ceilings or underfloor.

G. All cabling shall be supported a minimum of 4 feet on-center. Via ‘J’ hooks or other approved method.

H. Label each cable end with computer generated or neatly handwritten permanent ink permanent label.

3.02 CONDUIT/RACEWAYS:

A. Contractor shall provide and install all required conduit per local code requirements.

B. Coordinate with the FSAS contractor prior to rough-in.

C. Provide a cable tray to span the length of the Communications room and parallel to the equipment racks in the room.

3.03 TEST REPORTS

A. Contractor shall supply Test Reports, in both booklet form and electronic flat ASCII file format, showing all field tests performed to adjust each component and all field test performed to prove compliance with the specified performance criteria, upon completion of testing of the installed system.

B. Contractor shall supply one licensed copy of test equipment software which provides a means for viewing copper test results in the format that the original test equipment was designed, suitable for running in a DOS or Windows environment.

3.04 ACCEPTANCE

A. Acceptance of system shall occur after all required documentation, test results, certification of test results and test operation have been reviewed and accepted by the Riverside County Fire Department has occurred. Final acceptance shall include a visual inspection of the system in its entirety and written approval by the Riverside County Fire Department, or their appointed representative(s).

3.05 WARRANTY

A. Contractor shall certify and warrant the complete system for a period of one year from the date of building occupancy.

B. Contractor shall certify and warrant the Cat 6 cabling system for operation at current EIA/TIA 568B 100 MHz specifications for a period of not less than 25 years.

END OF SECTION

SECTION 28 31 00

FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. This performance specification document provides the requirements for the installation, programming and configuration of a complete IntelliKnight 6820XL digital protocol addressable fire alarm system, or approved equal by the Engineer of Record. This system shall include, but not be limited to, system cabinet, power supply, built in Signaling Line Circuit (SLC), 80 character LCD annunciator, six programmable “Flexput” circuits, built in dual line Digital Communicator, associated peripheral devices, communication with the City of Costa Mesa Fire Department central station monitoring company, batteries, wiring, conduit and other relevant components and accessories required to furnish a complete and operational Life Safety System.

B. The system shall be programmed to ensure that all audible devices in the station activate when any one smoke detector or manual pull station is activated.

C. Provide low frequency notification devices in all dorm rooms and dayroom.

D. Where required by code and/or indicated on plan, provide combination smoke detector-carbon monoxide detectors. Locate the detectors in the Hallway leading to the dorm rooms and dayroom. The system shall be programmed to ensure all low frequency notification devices alarm upon activation of any one detector in the system.

E. The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

F. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).

G. The Fire alarm system is a deferred approval item and the sole responsibility of the contractor to submit plans, equipment data sheets/listings, wiring diagrams and calculations to the City of Costa Mesa Fire Department for review and approval. The fire alarm system design shall be based on the building occupancies indicated on the Architectural Code Analysis drawing and as required by the City of Costa Mesa Fire Department.

H. The Fire Alarm submittal to the Fallbrook Fire Department shall bear the stamp and signature of a professional engineer registered in the State of California.

I. Installation of the fire alarm system shall commence upon approval of the fire alarm plans by the Costa Mesa Fire Department.

1.2 WORK INCLUDED

A. The contractor shall furnish and install a complete 24 VDC, electrically supervised, analog addressable fire alarm system as specified herein and indicated on the drawings. The system shall include but not be limited to all control panels, power supplies, initiating devices, audible and visual notification appliances, alarm devices, and all accessories required to provide a complete operating fire alarm system.

B. All fire alarm system equipment shall be listed for it's intended purpose and be compatibility listed to assure the integrity of the complete system.

1.3 CODES AND REGULATIONS

A. Underwriters Laboratory Inc.

B. 2022 California Building Code, Part 2, Title 24.

C. 2022 California Electrical Code, Part 3, Title 24.

D. 2022 California Mechanical Code, Part 4, Title 24.

E. 2022 California Fire Code, Part 9, Title 24.

F. 2022 California Building Standards Administrative Code, Part 1, Title 24, California Code of Regulations (CCR).

G. Public Safety, Title 19, C.C.R. State Fire Marshal regulations.

H. NFPA 72, Local Alarm Systems, Current edition with California Amendments.

I. Manufacturers Specifications.

1.4 SUBMITTALS

A. General:

1. Two copies of all submittals shall be submitted to the Architect/Engineer for review.

2. Submittals reviewed and accepted by the Architect/Engineer shall be submitted to the City of Costa Mesa Fire Department for final review and approval. Devices, equipment and services required by the City of Costa Mesa Fire Department shall be a part of this contract and the responsibility of this contractor to provide and install the devices, equipment and services required by the City of Costa Mesa Fire Department at no additional cost to the contract.

3. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.

4. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Shop Drawings/Product Data:

1. Within thirty-five (35) calendar days after the date of award of the Contract, the Contractor shall submit to the Architect for review, eight copies of a complete submission.

2. The submission shall consist of five major sections with each section separated with index tabs. Each page in the submission shall be numbered chronologically and shall be summarized in the index.

3. The first section shall be the "Index" which shall include the project title and address, name of the firm submitting the proposal and name of the Architect.

4. The second section shall include a copy of the Installing Fire Alarm Contractor's valid C-7 California State Contractors License, letters of factory authorization and guaranteed service, list of 20 projects of equal scope and list of proposed instrumentation to be used by the Contractor.

5. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished next to all of the specified equipment's features and functions as stated in the specifications and data sheets.

6. The fourth section shall contain an original factory data sheet for every piece of equipment in the specifications and current CSFM listings.

7. The fifth section shall contain voltage drop calculations for each circuit, battery calculations for the FACP and remote power supplies, sequence of operation, installation details, factory system/ device wiring diagrams and plan/site drawings indicating equipment/device locations and interconnecting wiring.

C. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.

2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.

3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

D. Software Modifications

1. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.

2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site.

E. Certifications:

Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

PART 2 - EQUIPMENT

2.1 GENERAL

A. Control Panel

The fire alarm control panel (FACP) shall be the Silent Knight 6820 analog addressable fire alarm control panel. The FACP must have a 6-amp power supply and be capable of expansion to a minimum of 50.5 total amps via bus connected expander modules that supervise low battery, loss off AC and loss of communication.

The FACP must be able to support 159 detectors and 159 analog addressable modules and expandable to a maximum of 1,110 analog addressable points per FACP. This shall be accomplished via a maximum of 63 signaling line circuits (SLC) capable of supporting up to 159 detectors and 159 addressable module devices each.

The FACP must have Drift Compensation sensitivity capabilities on detectors and be able to support 159 detectors and 159 analog addressable modules. The communication protocol on the SLC loop must be digital.

The FACP network must support up to 17 FACPs on the network providing a maximum addressable point capacity of 18,870 points (1,110 x 17 = 18,870).

The FACP must support a minimum of six programmable Flexputs. The panel must have a built in 80-character LCD annunciator with the capability of having a minimum of an additional 16 supervised remote annunciators connected in the field.

The FACP must have a built-in UL approved IP and digital communicator with the option of adding a cellular module for communications. The communicator must allow local up/downloading of system operating options, event history, and detector sensitivity data.

The FACP must automatically test the smoke detectors in compliance with NFPA standards to ensure that they are within listed sensitivity parameters and be listed with Underwriters Laboratories for this purpose.

The FACP must compensate for the accumulation of contaminants that affect detector sensitivity. The FACP must have a maintenance alert feature (differentiated from trouble condition), detector sensitivity selection, auto-programming mode, Jumpstart®, and the ability to upgrade the core operating software on site through USB or Ethernet cable.

The FACP shall have a Jumpstart feature that can automatically enroll all properly connected accessories into a functional system. Panels that do not have these capabilities will not be accepted.

The main communication bus (S-BUS RS485) shall be capable of Class A or class B configuration with a total Bus length of 6,000 feet.

B. System Wiring

The Signaling Line Circuit (SLC) and Data Communication Bus (S-BUS) shall be wired with standard NEC 760 compliant wiring, no twisted, shielded or mid capacitance wiring is required for standard installations. All FACP screw terminals shall be able to accept 12-18 AWG wire. All system wiring shall be in accordance with the requirements of NFPA 70, the National Electrical Code (NEC) and comply with article 760 of the NEC.

C. Signaling Line Circuits

Each SLC shall be capable of a wiring distance of 5,000 feet from the SLC driver module (6815) and be able to support up to 159 detectors and 159 addressable module devices. The communication protocol to SLC devices must be digital. Any SLC loop device, which goes into alarm, must interrupt the polling cycle for priority response from the FACP. The FACP must respond consistently to a device that goes into alarm on an SLC in under 10 seconds. The auxiliary 6815 SLC loop module must be capable of being located up to 6000 feet from the FACP on an RS-485 bus, which is separate from the SLC bus. The SLC shall be capable of functioning in a class A or class B configuration.

D. SLC loop devices

Devices supported must include photoelectric smoke detectors, heat detectors, combination fire and CO detectors, contact monitoring modules and relay output modules. There is to be no limit to the number of any particular device type, up to the maximum of 99 detectors and 99 modules that can be connected to the SLC.

E. Addressable detector functions

The products of combustion detectors must communicate analog values using a digital protocol to the control panel for the following functions:

1. Automatic compliance with NFPA 72 standards for detector sensitivity testing
2. Drift compensation to assure detector is operating correctly
3. Maintenance alert when a detector nears the trouble condition
4. Trouble alert when a detector is out of tolerance
5. Alert control panel of analog values that indicate fire.

F. Programmable Flexputs

The FACP shall support six programmable Flexput circuits that are capable of being programmed as supervised reverse polarity notification circuits or supervised auxiliary power circuits that can be programmed as continuous, resettable or door holder power. The circuits shall also be programmable as input circuits in class A or B configurations to support dry contact or compatible two wire smoke detectors.

G. Addressable Notification Modules

The contractor shall furnish and install where indicated on the plans, addressable notification modules, Honeywell Silent Knight Model SK-CONTROL. The modules shall be U.L. listed compatible with Honeywell Silent Knight 6820 fire alarm control panel. The notification module must provide one class A (Style Z) or class B (Style Y) notification output with one auxiliary power input. The notification module must be suitable for mounting in a standard 4 square electrical box, and must include a plastic cover plate. The notification module must provide an LED that is visible from the outside of the cover plate. The notification module must be fully programmable for such applications as required by the installation. The SK-CONTROL shall reside on the SLC loop and can be placed up to 5,000 feet from the control or 6815 SLC loop module.

H. Built-in Annunciator

The main control must have a built-in annunciator with an 80-character LCD display and feature LEDs for Alarm, Supervisory, Trouble, Silenced and Power. When in the normal condition the LCD shall display time and date based on a 200-year clock which is capable of automatic daylight savings time adjustments. All controls and programming keys are silicone mechanical type with tactile and audible feedback. Keys have a travel of .040 in. No membrane style buttons will be permissible. The annunciator must be able to silence and reset alarms. The annunciators must have twenty levels of user codes that will allow the limitation of operating system programming to authorized individuals.

I. Remote Annunciators

The fire system shall be able to support remote annunciators. All annunciators must have 80 -160-character LCD/LED displays and must feature five LEDs for Alarm, Supervisory, Trouble, Silenced, and Power. All controls and programming keys are silicone mechanical type with tactical and audible feedback. Keys shall have a travel of .040 inches. No membrane style buttons will be permitted.

The annunciator must be able to silence and reset alarms. The annunciator must have twenty levels of user codes that will limit the operating system programming to authorized individuals. The control panel must allow all annunciators to accommodate multiple users input simultaneously. Remote annunciators shall be capable of operating at 6,000 feet from the main control panel on unshielded, non-twisted cable.

The fire system shall be able to support up to 16 remote annunciators. The exact number will be determined by type, LCD or LED. LED Remote annunciators shall have individually mapped LEDs and reset and silence input.

J. I/O LED Driver Module

The fire system shall be able to support up to eight I/O modules on the SBUS that shall be used to drive remote LED graphic style displays and accommodate up to eight dry contact type switch inputs. The I/O modules shall each drive up to 40 LEDs without requiring external power connections. The I/O module inputs shall be supervised and shall be suitable for alarm and trouble circuits as well as reset and silence switches. These driver boards shall contain 80 LED outputs that are powered by an external power source.

K. Serial/Parallel Interface

The fire system shall able to support up to two serial / parallel interfaces that can drive standard computer-style printers (line printers only). The interface shall be programmable as to what information is sent to it and shall include the ability to print out Detector Status, Event History and System Programming.

L. Distributed Power Module

The contractor shall supply power modules, Models 5496 and 5895XL, compatible with the model 6820 fire alarm control panel. The power module must have 6 amps of output power, six Flexput circuits rated at 3 amps each, and two Form C relay circuits rated at 6 amps at 24 volts DC. The six Flexput circuits shall be capable of being programmed as supervised reverse polarity notification circuits or supervised auxiliary power circuits that can be programmed as continuous, resettable or door holder power. The circuits shall also be programmable as input circuits in Class A or B configurations to support dry contact or compatible two wire smoke detectors.

The power module shall be capable of being connected via an RS-485 system bus (SBUS) at a maximum distance of 6,000 feet from the main control panel. It shall contain an additional RS-485 system bus that is completely compatible with all 6820 add-on SBUS modules, annunciators, serial/parallel modules and addressable devices. The power module will also act as a bus repeater so that additional RS-485 (modules) devices can be connected at a maximum distance of 6,000 feet from the power module.

The 5496 and 5895XL power modules must have 6 amps of output power and four circuits rated at 3 amps each. The four circuits can be programmed as notification outputs or auxiliary power outputs of door holder, constant, resettable and sounder base synchronization types.

The 6820 shall be able to support up to eight (8) of the Distributed Power Modules in any combination.

The power module's RS-485 bus shall be electrically isolated providing ground loop isolation and transient protection.

M. Digital Communicator

The digital/IP communicator must be an integral part of the control panel and be able to report all zones or points of alarm, supervisory, and trouble as well as all system status information such as loss of AC, low battery, ground fault, loss of supervision to any remote devices with individual and distinct numeric codes to a central station or remote station. The communicator must also be capable of up/downloading all system programming options, event history and detector sensitivity compliance information to a PC on-site through a USB or Ethernet cable. It shall transmit the information by one or more of the following means of communication – internet, cellular or standard telephone lines.

The communicator must be capable of reporting via SIA and Contact ID formats. The communicator shall have a delayed AC loss report function which will provide a programmable report delay plus a 10-25 min random component to help ease traffic to the central station during a power outage. No controls that use external modems for remote programming and diagnostics shall be accepted.

N. Dry Contacts

The FACP shall have three Form "C" dry contacts, one will be dedicated to trouble conditions, the other two will be programmable for alarm, trouble, supervisory, notification, pre-alarm, waterflow, manual pull, aux. 1 or aux. 2 conditions. The trouble contact shall be normal in an electrically energized state (fail-safe) so that any total power loss (AC and Backup) will cause a trouble condition. If the microprocessor on the FACP fails, the trouble contacts shall also indicate a trouble condition.

O. Ground Fault Detection

A ground fault detection circuit shall be employed which can detect a ground fault on both the positive and negative side of each circuit. The ground fault detector shall operate the general trouble devices as specified but shall not cause an alarm to be sounded. Ground faults shall not interfere with normal operation, such as alarm, or other trouble conditions.

P. Over Current Protection

All low voltage circuits will be protected by microprocessor controlled power limiting or have self-restoring polyswitches for the following: smoke detector power, main power supply, indicating appliance circuits, battery standby power and auxiliary output.

Q. Test Functions

1. A "Lamp Test" mode shall be a standard feature of the fire alarm control panel and shall test all LEDs and the LCD display on the main panel and remote annunciators.

2. A "Walk Test" mode shall be a standard feature of the fire alarm control panel. The walk test feature shall function so that each alarm input tested will operate the associated notification appliance for six seconds. The FACP will then automatically perform a reset and confirm normal device operation. The event memory shall contain the information on the point tested, the zone tripped, the zone restored, and the individual points return to normal.

3. A "Fire Drill" mode shall allow the manual testing of the fire alarm system notification circuits. The "Fire Drill" shall be capable of being controlled at the main annunciator, remote annunciators and via a remote contact input.

4. A "Disable Mode" shall allow for any zone, point, group, or NAC circuit to be disabled without affecting the operation of the total fire system.

R. Remote Input Capabilities

The control panel shall have provisions for supervised switch inputs for Alarm reset and Alarm and Trouble silence.

S. Notification Appliance Mapping Structure

All notification circuits and modules shall be programmable via a mapping structure that allows for a maximum of 999 output groups. Each of these groups shall be able to be triggered by any of the panels 999 zones. A group may be triggered from a zone individually, or may contain a global trigger for manual pull stations, fire drills and two different system alarms.

Each zone will individually control the cadence pattern of each of the groups that it is “Mapped” to so that sounders can indicate a variety of conditions. The zone shall able to issue a different cadence pattern for each of the groups under its control. The mapping structure must also allow a group to be designated to “ignore cadence” for use with strobes and other continuous input devices.

Zones shall have eight different output categories; Detector alarm, Trouble, Supervisory, Pre-alarm, Waterflow, Manual pull, Zone auxiliary one and Zone Auxiliary two. Each of the categories shall be able to control from 1 to 8 output groups with a cadence pattern. The patterns are; March code, ANSI 3.41, Single Stroke Bell Temporal, California code, Zone 1 coded, Zone 2 coded, Zone 3 coded, Zone 4 coded, Zone 5 coded, Zone 6 coded, Zone 7 coded, Zone 8 coded, Custom output pattern 1, Custom output pattern 2, Custom output pattern 3, Custom output pattern 4 and Constant.

Each NAC circuit can also be configured to produce one of four synchronization patterns: AMSECO synchronization, Gentex synchronization, System Sensor synchronization, and Wheelock synchronization. This mapping/cadence pattern shall be supported by all system power supplies and Notification Expander Modules. This mapping/cadence pattern shall be supported by all system power supplies and Notification Expander Modules.

In addition, synchronization is built-in for Amseco®, Gentex®, System Sensor®, and Wheelock® devices. This mapping/cadence pattern shall be supported by all system power supplies and Notification Expander Modules.

T. Downloading Software

The fire alarm control panel must support up/downloading of system programming from a PC under Windows or NT environments. The FACP must also be able to upload the detector sensitivity test results and a 1,000-event system event buffer to the PC.

Communication shall take place over a direct connection to the PC through a USB or Ethernet cable and shall not require an external modem to be connected to the panel. The downloading software shall contain a code that will block unauthorized persons from accessing the panel via direct connection or ethernet.

U. English Language Descriptions

The FACP shall provide the ability to have a text description of each system device input zone and output group on the system. The use of individual lights to provide descriptions will not be acceptable.

2.2 SYSTEM OPERATION

A. Alarm

When a device indicates any alarm condition the control panel must respond within 10 seconds. The General Alarm or Supervisory Alarm LED on the annunciator(s) should light and the LCD should prompt the user as to the number of current events. The alarm information must be stored in event memory for later review. Event memory must be available at the main and all remote annunciators.

When the alarmed device is restored to normal, the control panel shall be required to be manually reset to clear the alarm condition, except that the alarms may be silenced as programmed.

An alarm shall be silenced by a code at the main or remote annunciators. When silenced, this shall not prevent the resounding of subsequent events if another event should occur (subsequent alarm feature). When alarms are silenced the silenced LED on the control panel, and on any remote annunciators shall remain lit, until the alarmed device is returned to normal.

B. Troubles

When a device indicates a trouble condition, the control panel System Trouble LED should light and the LCD should prompt the user as to the number of current events. The trouble information must be stored in event memory for later review. Event memory must be available at the main and all remote annunciators.

When the device in trouble is restored to normal, the control panel shall be automatically reset. The trouble restore information must be stored in event memory for later review. Event memory must be available at the main and all remote annunciators. A trouble shall be silenced by pressing Silence at the main panel or a code or Firefighter key at the remote annunciators. When silenced, this shall not prevent the resounding of subsequent events if another event should occur.

C. Supervision methods

Each SLC loop shall be electrically supervised for opens and ground faults in the circuit wiring, and shall be so arranged that a fault condition on any loop will not cause an alarm to sound. Additionally, every addressable device connected to the SLC will be supervised and individually identified if in a fault condition. The occurrence of any fault will light a trouble LED and sound the system trouble sounder, but will not interfere with the proper operation of any circuit which does not have a fault condition.

Each indicating appliance circuit shall be electrically supervised for opens, grounds and short circuit faults, on the circuit wiring, and shall be so arranged that a fault condition on any indicating appliance circuit or group of circuits will not cause an alarm to sound. The occurrence of any fault will light the trouble LED and sound the system trouble sounder, but will not interfere with the proper operation of any circuit which does not have a fault condition.

2.3 SYSTEM CABINET

A. Mounting

The system cabinet shall be red and can be either surface or flush mounted. The cabinet door shall be easily removable to facilitate installation and service.

B. Audible System Trouble Sounder

An audible system trouble sounder shall be an integral part of the control unit. Provisions shall also be provided for an optional supervised remote trouble signal.

C. Power Supply and Charger:

The entire system shall operate on 24 VDC, filtered switch mode power supply with the rated current available of 6 amps. The FACP must have a battery charging circuit capable of complying with the following requirements:

Twenty-four (24) hours of battery standby with five (5) minutes of alarm signaling at the end of this twenty-four (24) hour period (as required per NFPA 72 central station signaling requirements) using rechargeable batteries with automatic charger to maintain gel-cell batteries in a fully charged condition.

The power supply shall comply with UL Standard 864 for power limiting.

The FACP will indicate a trouble condition if there is a loss of AC power or if the batteries are missing or of insufficient capacity to support proper system operation in the event of AC failure. A "Battery Test" will be performed automatically every minute to check the integrity of the batteries. The test must disconnect the batteries from the charging circuit and place a load on the battery to verify the battery condition.

If it is necessary to provide additional power one or more of the model 5496 or 5895XL distributed power modules shall be used to accomplish this purpose.

D. Connections and Circuits

Connections to the light and power service shall be on a dedicated branch circuit in accordance with the National Electrical Code (NEC) and the local authority having jurisdiction (AHJ).

The circuit and connections shall be mechanically protected.

A circuit disconnecting means shall be accessible only to authorized personnel and shall be clearly marked "FIRE ALARM CIRCUIT CONTROL".

2.4 THE FACP SHALL SUPPORT A THE FOLLOWING DEVICES ON THE RS-485 DATA BUS:

6815	Signaling Line Circuit Expander (SLC) Module
6860	LCD Remote Annunciator
6855	LCD Remote Annunciator
5860	LCD Remote Annunciator
5824	Printer Interface Module
5865-3	LED Remote Annunciator
5865-4	LED Remote Annunciator with reset and silence switches
5880	LED I/O module
5883	Relay Interface Board
5895XL	Intelligent Distributed Power Module
5496	Intelligent Remote Power Supply 6.0 Amp
SK-NIC	Network Interface Card

SK-NIC-KIT	Installation Accessory Kit
SK-FML	Fiber Module, Multi-Mode
SK-FSL	Fiber Module, Single-Mode

2.5 THE FACP SHALL SUPPORT THE OPERATION OF 159 TOTAL DEVICES PER SLC LOOP WITHOUT REGARD TO DEVICE TYPE. THE FOLLOWING DEVICES SHALL BE SUPPORTED:

SK-PHOTO	Addressable Photoelectric Smoke detector
SK-PHOTO-T	Addressable Photoelectric Smoke detector with Thermal
SK-PHOTOR	Addressable Photoelectric Smoke detector with Relay
SK-FIRE-CO	Addressable Combination Photoelectric and CO Detector
SK-HEAT	Addressable Heat Sensor
SK-HEAT-ROR	Addressable Heat with Rate of Rise
SK-HEAT-HT	Addressable Heat High temp 190°
SK-ACCLIMATE	Addressable Multi Criteria Smoke detector with thermal
SK-6AB	6” detector base
SK-DUCT	Addressable Duct Detector Housing
SK-RELAY	Addressable Relay Module
SK-RELAY-6	Addressable Multi Relay Module
SK-RELAYMON-2	Addressable Relay/Input Module
SK-MONITOR	Addressable Input Module (Class A or B)
SK-MINIMON	Mini Input Module
SK-MONITOR-2	Addressable Dual Input Module
SK-MON-10	Addressable Multi Input Module (10)
SK-CONTROL	Addressable Notification Module
SK-CONTROL-6	Addressable Notification Multi Module (6)
SK-ZONE	Two Wire Smoke Detector Module
SK-ZONE-6	6 Multi Smoke Detector Module
SK-ISO	Isolation Module
SK-BEAM	Addressable Beam Detector
SK-BEAM-T	Addressable Beam Detector with Test feature

B224BI	Addressable Isolator base
B224RB	Detector Relay Base
B200S	Intelligent Detector Synchronized Sounder Base
B200S-LF	Intelligent Detector Low Frequency Synchronized Sounder Base
B200SR	Intelligent Detector Sounder Base
B200SR-LF	Intelligent Detector Low Frequency Sounder Base
RTS151KEY	Remote Test Switch for Photoelectric Duct Detector
RTS151	Remote Test Switch for Photoelectric Duct Detector
SK-Pull-SA	Addressable Single Action Pull Station
SK-Pull-DA	Addressable Dual Action Pull Station

The FACP shall support these other Honeywell devices via addressable input, addressable notification, or addressable output modules.

PS-SATK	Single Action Pull Station – Key Reset
PS-DATK	Double Action Pull Station – Key Reset

2.6 MANUAL FIRE ALARM STATIONS

Manual fire alarm stations shall be non-coded, break glass, single or double action type, with a key operated test-reset lock in order that they may be tested, and so designed that after actual emergency operation, they cannot be restored to normal except by use of a key. The reset key shall be so designed that it will reset manual station and open FACP without use of another key. An operated station shall automatically condition itself to be visually detected, as operated, at a minimum distance of fifty feet, front or side. Manual stations shall be constructed of die cast metal or polycarbonate with clearly visible operating instructions on the front of the stations in raised letters.

Stations shall be suitable for surface mounting on matching back box, or semi-flush mounting on a standard single-gang box, and shall be installed within the limits defined by the Americans with Disabilities Act (ADA) dependent on manual station accessibility or per local requirements.

If using conventional pull stations, they must be installed in conjunction with an Addressable Input Module (SK-Monitor) or Mini Input Module (SK-Minimon). Manual stations shall be Silent Knight Model PS-DATK, PS-SATK, and Honeywell Underwriters Laboratories listed when used with addressable modules.

2.7 REMOTE POWER SUPPLIES

The remote power supplies for notification appliances shall be models 5496 and/or 5895XL. The intelligent power supply shall wire on the main SBUS and be programmed through the 6820 panel. The 5496 will support 6 amps of 24-volt DC power, with 6 Flexput circuits, rated at 3 amps each. The 5895XL will support 6 amps of 24-volt DC power, with 6 Flexput circuits, rated at 3amps each. The 5895XL power supply will also regenerate the S-Bus for an additional 6000 feet.

The 5496 intelligent power supply shall wire on the main SBUS and be programmed through the 6820. It will support 6 amps of 24-volt DC power with 4 notification circuits, rated at 3 amps each.

The remote power supply model 5499 or 5495 may also be used on the system. These power supplies are activated by notification circuit or the SK-CONTROL module and support 24VDC power, with 4 notification circuits, rated at 3 amps each. The total power on a 5495 is 6 amps. The total power on a 5499 is 9 amps. These power boosters may also be activated from another notification circuit from either the fire alarm control, or a distributed power supply.

2.8 NOTIFICATION DEVICES

The visual and audio/visual signaling devices shall be compatible with the 6820, 5495, 5496, 5499, or 5895XL as stated in the installation manuals and be listed with Underwriters Laboratories Inc. per UL 1971 and/or 1638. Each indicating appliance circuit shall be electrically supervised for opens, grounds and short circuit faults, on the circuit wiring, and shall be so arranged that a fault condition on any indicating appliance circuit or group of circuits will not cause an alarm to sound. The occurrence of any fault will light the trouble LED and sound the system trouble sounder, but will not interfere with the proper operation of any circuit which does not have a fault condition.

The notification appliance (combination audio/visual units only) shall produce a peak sound output of 90dba or greater as measured in an anechoic chamber. The appliance shall be able to meet the candela requirements of the blueprints presented by the Engineer and ADA. The appliance shall be polarized to allow for electrical supervision of the system wiring.

The unit shall be provided with terminals with barriers for input/output wiring and be able to mount a single gang or double gang box or double workbox with the use of an adapter plate. The unit shall have an input voltage range of 19-30 volts. Devices that meet these requirements can be found at www.systemsensor.com, or equivalent.

2.9 SMOKE DETECTORS

Smoke detectors shall be Honeywell Silent Knight Model SK-PHOTO, ceiling mounted, analog/addressable photoelectric smoke detector, SK-Acclimate multi-criteria photoelectric smoke detector, or the SK-FIRE-CO multi-criteria ceiling mounted fire and carbon monoxide detector. The combination detector head and twist lock base shall be U.L. listed compatible with the Honeywell Silent Knight 6820 fire alarm control panel. The base shall permit direct interchange with the Honeywell Silent Knight SK-ACCLIMATE and SK-HEAT detectors. The base shall be the appropriate twist lock base B210LP.

The smoke detector shall have a flashing status LED for visual supervision. When the detector is actuated, the flashing LED will latch on steady at full brilliance. The detector may be reset by actuating the control panel's reset switch. The sensitivity of the detector shall be capable of being selected and measured by the control panel without the need for external test equipment. The vandal security-locking feature shall be used in those areas as indicated on the drawing.

The locking feature shall be field selectable when required. It shall be possible to perform a sensitivity test of the detector without the need of generating smoke. The test method shall simulate the effects of products of combustion in the chamber to ensure testing of the detector circuits.

Detectors shall have completely closed back to restrict entry of dust and air turbulence and have a 30-mesh insect screen. Electronics of the unit shall be shielded to protect against false alarms from E.M.I. and R.F.I.

2.10 HEAT DETECTORS

Furnish and install analog/addressable heat detectors, Honeywell model SK-HEAT. The combination heat detector and twist lock base shall be U.L. listed compatible with the Honeywell 6820 fire alarm control panel. The base shall permit direct interchange with the Honeywell Silent Knight SK-PHOTO, or SK-ACCLIMATE detectors. The base shall be the appropriate twist lock base B210LP.

The heat detector shall have a flashing status LED for visual supervision. When the detector is actuated, the flashing LED will latch on steady at full brilliance. The detector may be reset by actuating the control panel's reset switch. The vandal security-locking feature shall be used in those areas as indicated on the drawings. Electronics of the unit shall be shielded to protect against false alarms from E.M.I. and R.F.I.

2.11 DUCT DETECTORS

Duct Detector shall be Honeywell Silent Knight Series Model DNR Duct Detector Housing. A separate SK-PHOTO or SK-PHOTOR is required. The duct detector housing shall be able to house the SK-RELAY module for optional output devices.

2.12 LOW FREQUENCY NOTIFICATION APPLIANCES

Provide low frequency notification appliances in all sleep areas and common living areas of the fire station. Sounders shall be UL Listed under Standard 464 to meet the NFPA 72 (Fire) and NFPA 720 (CO Life Safety) requirements for sleeping rooms. Selectable Tones (Temporal 3, Temporal 4, or Continuous), capable of synchronized coded output from fire alarm control panel (FACP) notification appliance circuit when set to "Continuous".

PART 3 - EXECUTION

3.1 INSTALLER'S RESPONSIBILITIES

Per California codes all individuals involved in the installation of the fire alarm system shall hold a valid State of California, Division of Apprenticeship Standards (DAS), Fire/Life Safety Technician Certification.

The installer shall coordinate the installation of the fire alarm equipment. All conductors and wiring shall be installed according to the manufacturer's recommendations.

It shall be the installer's responsibility to coordinate with the supplier, regarding the correct wiring procedures before installing any conduits or conductors.

All start-up programming and system commissioning shall be performed by a Silent Knight trained and certified technician.

Provide the NFPA certificate to the Owner, local Fire Marshal, and Architect.

Instruction shall be provided 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 to the Fire Department's satisfaction.

The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

3.2 INSTALLATION OF SYSTEM COMPONENTS

System components shall be installed in accordance with the latest revisions of the appropriate NFPA pamphlets, the requirements contained herein, National Electrical Code, local and state regulations, the requirements of the fire department and other applicable authorities having jurisdiction (AHJ).

All wire used on the fire alarm system shall be U.L. Listed as fire alarm protection signaling circuit cable per California Electrical Code, Articles 760.

3.3 WARRANTY AND FINAL TEST

A. General

The contractor shall warrant all equipment and wiring free from inherent mechanical and electrical defects for one year (365 days) from the date of final acceptance.

B. Final Test

Before the installation shall be considered completed and acceptable by the awarding authority, a test of the system shall be performed as follows:

1. The contractor's job foreman, a representative of the owner, Inspector of Record (IOR), and the fire department shall operate every building fire alarm device to ensure proper operation and correct annunciation at the control panel.

2. At least one half of all tests shall be performed on battery standby power.

3. Where application of heat would destroy any detector, it may be manually activated.

4. The communication loops and the indicating appliance circuits shall be opened in at least two (2) locations per circuit to check for the presence of correct supervision circuitry.

5. When the testing has been completed to the satisfaction of both the contractor's job foreman and owner, a notarized letter cosigned by each attesting to the satisfactory completion of said testing shall be forwarded to the owner and the fire department.

6. The contractor shall leave the fire alarm system in proper working order, and, without additional expense to the owner, shall replace any defective materials or equipment provided by him under this contract within one year (365 days) from the date of final acceptance by the awarding authority.

7. Prior to final test the fire department must be notified in accordance with local requirements.

3.4 AS BUILT DRAWINGS, TESTING, AND MAINTENANCE INSTRUCTIONS

A. As Built Drawings

A complete set of reproducible "as-built" drawings showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of system.

B. Operating and Instruction Manuals

Operating and instruction manuals shall be submitted prior to testing of the system. Three (3) complete sets of operating and instruction manuals shall be delivered to the owner upon completion. User operating instructions shall be provided prominently displayed on a separate sheet located next to the control unit in accordance with U.L. Standard 864.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Remove surface debris.

B. Remove indicated paving, curbs, and other items as shown on the plans.

C. Clear site of plant life and grass.

D. Remove trees and shrubs.

E. Remove root system of trees and shrubs.

F. Erosion and sedimentation control measures.

1.2 REGULATORY REQUIREMENTS

A. Conform to applicable code for dust control and disposal of debris.

B. Coordinate clearing Work with utility companies.

C. Obtain required permits from authorities.

D. Do not close or obstruct roadways and sidewalks without permits.

1.3 DEFINITIONS

A. Remove: Removal of existing construction and legally dispose of items off-site unless indicated to be removed and salvaged or recycled.

B. Disposal: Removal off-site of demolition waste and subsequently deposit in landfill acceptable to authorities having jurisdiction.

C. Salvage: Recovery of demolition waste for subsequent reuse.

D. Existing to Remain: Items of construction that are not to be removed and that are not indicated to be removed.

1.4 SUBMITTALS

A. Preclearing Photographs: Show conditions of existing adjacent construction and site improvements that might be misconstrued as damaged by clearing operations. Submit before work begins.

B. Record Documents: Submit under provisions of Section 01 77 00. Accurately record locations of capped utilities and other subsurface conditions.

1.5 QUALITY ASSURANCE

A. Perform best management practice techniques for given site conditions as defined in Section 3 of the Stormwater Best Management Practice Handbook (BMP Handbook), Construction Edition, as published by the California Storm Water Quality Association.

B. Coordinate work of this section with permit provisions of State Water Resources Control Board Order No. 2010-0014-DWQ and the Storm Water Pollution Prevention Plan.

C. Comply with City of Costa Mesa Dust Control Ordinance.

2. PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete as specified in Section 01 74 19.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Correlate existing conditions with requirements indicated.

B. Inventory and record condition of items to be removed and salvaged.

C. Execute predemolition photographs.

3.2 PREPARATION

A. Verify that existing plant life and features designated to remain are tagged or identified.

3.3 EROSION AND SEDIMENTATION CONTROL

A. Provide erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of Storm Water Pollution Prevention Plan.

B. Inspect, repair, and maintain erosion and sedimentation control measures during clearing operations.

3.4 PROTECTION

A. Protect utilities that remain, from damage.

B. Protect trees, plant growth, and features designated to remain as final landscaping.

C. Protect bench marks from damage or displacement.

3.5 CLEARING

A. Clear areas required for access to site and execution of Work.

B. Remove trees and shrubs indicated. Remove stumps, main root ball (complete).

C. Clear undergrowth and deadwood without disturbing subsoil.

D. Remove debris, rock, and extracted plant life.

E. Remove paving, curbs, and other items as indicated. Neatly saw cut edges at right angle to surface.

3.6 RECYCLING OF DEMOLITION MATERIALS

A. Recycle demolition waste under the provisions of Section 01 74 19.

A. Separate recycled demolition materials from other demolished materials.

B. Stockpile processed materials on-site without intermixing with other materials.

C. Place, grade, and shape stockpiles to drain surface water. Cover to prevent wind blown dust.

D. Do not store materials within drip line of trees.

E. Transport recyclable materials that are not indicated to be reused off Owner's property to recycling receiver or processor.

F. Recycled incentives received for building demolition materials shall be equally shared between Contractor and Owner.

G. Asphalt: Break up and transport asphalt paving to asphalt recycling facility.

H. Concrete: Break up and transport to concrete-recycling facility.

H. Concrete Reinforcement: Remove reinforcement from concrete and sort with other metals.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Except for items to be recycled or otherwise indicated to remain, remove demolished materials from Project site and legally dispose of them in an EPA – approved landfill.

B. Do not burn or bury materials on site.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt and debris caused by clearing.

B. Return adjacent areas to condition existing before clearing operations began.

C. Leave site in a clean condition.

END OF SECTION

SECTION 31 20 00

EARTH MOVING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Top soil excavation.

B. Site rough grading.

C. Building excavation, backfill and compaction.

D. Excavation for pavements and site structures.

E. Consolidation and compaction.

F. Fill for overexcavation.

G. Utility trenches, backfill and compaction.

H. Subgrade preparation of pavement areas.

I. Finish grading.

J. Erosion and sedimentation control measures.

1.2 REFERENCES

A. CBC - California Building Code, Title 24, Part 2, Chapter 18 and Appendix J.

B. City of Costa Mesa Code.

C. City of Costa Mesa Dust Control Ordinance.

D. Storm Water Quality Association - Stormwater Best Management Practice Handbook (BMP Handbook) Construction Edition.

E. State Water Resources Control Board Order No. 2010-0014-DWQ.

F. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

G. ASTM D448 - Sizes of Aggregate for Roadway and Bridge Construction.

H. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

I. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop.

J. ASTM D2922 – Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods. (Shallow Depth).

K. ASTM D2937 – Test Method for Density of Soil in Place by the Drive-Cylinder Method.

L. ASTM D3017 – Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Submit samples under provisions of Section 01 33 00.

B. Submit 10 lb. sample of each type of fill to testing laboratory in air-tight containers.

C. Submit name of imported materials source. Provide materials from same source throughout the work. Change of source requires Architect's approval.

D. Submit test reports under provisions of Section 01 45 29.

1.4 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit manufacturer’s data for pre-consumer and post-consumer recycled content under provisions of Section 01 81 13.

1.5 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Section 01 77 00.

B. Accurately record location of utilities remaining, rerouted utilities, new utilities by horizontal dimensions, elevations or inverts, and slope gradients.

1.6 QUALITY ASSURANCE

A. Comply with California Building Code (CBC), Title 24, Part 2, Chapter 18 and Appendix J.

B. Comply with City of Costa Mesa Code.

C. Comply with City of Costa Mesa Dust Control Ordinance.

D. Perform best management practice dust control techniques for given site conditions as defined in Section 3 of the Storm Water Best Management Practice Handbook, (BMP Handbook) Construction Edition.

E. Comply with all CALOSHA safety requirements for excavations, shoring, and backfilling.

1.7 FIELD CONDITIONS

A. Verify that survey benchmark and intended elevations for the work areas are as indicated.

B. Notify Architect of unexpected subsurface conditions and discontinue work in area affected until notified to resume work.

C. Perform site assessment to identify any contaminated soils which may occur on site.

1.8 PROTECTION

A. Protect trees, shrubs, lawns, and other features remaining as portion of final landscaping.

B. Protect bench marks, fences, roads, sidewalks, paving, and curbs.

C. Underpin adjacent structures, including utilities and pipe chases, which may be damaged by excavation work.

D. Protect above or below grade utilities which are to remain.

E. Barricade open excavations and post warning lights. Operate lights from dusk to dawn.

F. Protect facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

G. Repair or replace all damage.

2. PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Existing Subsoil: Excavated and re-used material, graded free of lumps and rocks larger than 3 inches in any dimension.

B. Imported Subsoil: Any imported soil or aggregate material to be evaluated for its suitability as onsite fill material should be submitted to a Leighton Geotechnical Laboratory at least two working days in advance of earth material placement and compaction.

C. Existing Topsoil: Excavated and re-used material, graded free of roots, rocks larger than one inch, subsoil, debris and large weeds.

D. Imported Topsoil: Friable loam, free of subsoil, roots, grass, excessive amounts of weeds, stones and foreign matter; acidity range (ph) of 5.5 to 7.5; containing an amount of organic matter normal to the region.

E. Sand: Natural river or bank sand: Free of silt, clay, loam, friable or soluble materials or organic matter, graded in accordance with ASTM C136, all passing the No. 4 sieve and only 5 percent passing the No. 200 sieve.

F. Gravel: Coarse aggregate; free of clay, shale and organic matter; ASTM D448, grading size 6 with 100 percent passing a 1 inch sieve and not more than 5 percent passing a No. 4 sieve.

G. Pea Gravel: Natural Stone; washed, free of clay, slate, organic matter, graded in accordance with ASTM C136, 1/4 inch to 5/8 inch.

H. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, graded in accordance with ASTM C136, with 100 percent passing a 1-1/2 inch sieve and not more than 5 percent passing a No. 4 sieve.

I. Crushed Stone Base: Permeable base meeting California Department of Transportation 3/4 inch Permeable Class II Base designation according to the following gradation:

Mesh Size	% Passing
1 inch	100
3/4 inch	90-100
3/8 inch	40-100
#4	25-40
#8	18-33
#30	5-15

Mesh Size	% Passing
#50	0-7
#200	0-3

J. Concrete: Structural concrete conforming to Section 03 30 00 with a compressive strength of 2,000 psi for fill to correct over-excavation.

K. Materials (existing and import) shall be free of any toxic materials listed (by the federal or state EPA or federal or state health agencies) as hazardous material.

L. Materials (existing and import) are subject to the approval of the Soils Engineer for use in the project.

M. Provide imported materials when sufficient satisfactory soil materials are not available from on site sources.

2.2 ACCESSORIES

A. Permeable Geotextile Fabric: 14ON fabric manufactured by Mirafi Inc., www.tcmirafi.com or equal.

B. Impermeable Geotextile Fabric: Reinforced liner, 20 mils thick; Hercuscrim 20 Fabric manufactured by In-Line Plastics, LC, www.in-lineplastics.com.

C. Substitutions: Under provisions of Section 01 25 13.

2.3 EQUIPMENT

A. Equipment: Capable of excavating subsoil, mixing and placing materials, wetting, consolidation, grading, and compaction of material.

3. 3 EXECUTION

3.1 INSPECTION

A. Verify agreement of existing site conditions with indicated conditions.

B. Notify Architect of discrepancies found.

C. Beginning work of this Section constitutes acceptance of existing conditions.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Identify known below grade utilities. Stake and flag locations.

C. Identify and flag above grade utilities.

D. Maintain and protect existing utilities remaining which pass through work area.

E. Notify utility company and pay all costs to remove and relocate utilities.

F. Upon discovery of unknown utility or concealed conditions, discontinue affected work; notify Architect.

3.3 EROSION AND SEDIMENTATION CONTROL

A. Provide erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways according to requirements of the Storm Water Pollution Prevention Plan and in accordance with the Erosion Control Plan.

B. Inspect, repair, and maintain erosion and sedimentation control measures during earthwork operations.

3.4 TOPSOIL EXCAVATION

A. Excavate topsoil from entire site.

B. Stockpile in area designated on site.

C. Stockpile topsoil to depth not exceeding 8 feet. Place, grade, and shape stockpile for proper drainage.

3.5 GRADING

A. All existing fill to be completely removed, which were found to be generally 3 to 5 feet thick, but locally thicker undocumented fills are expected to be exposed during grading.

B. Uniformly grade areas within limits of grading including adjacent transition areas.

C. Make such cuts or fills as may be required to bring subgrade to elevations shown and to tolerances specified.

D. Plow or otherwise break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond to existing surface.

E. Where grades are not indicated, grade uniformly level or slope between points for which elevations are given.

F. In absence of more specific grading information, slope ground away from building for a distance of 20 feet at 2 percent.

G. Make grade changes gradual. Blend slope into level areas.

H. Compact each layer of fill to required density.

3.6 EXCAVATION FOR STRUCTURES

A. Excavate subsoil required to accommodate building foundation, site structures, and construction operations.

B. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot.

C. Extend a sufficient distance from footings and foundations to permit placing and removal of formwork, installation of services, other construction, and for inspection.

D. Overexcavate a minimum depth of 3 feet beneath all footings or at least 5 feet below exisiting grade, whichever is deeper.

E. Overexcavation bottoms should extend horizontally either the thickness of fill below finish grade or at least 5 feet horizontally beyond the outside edges of proposed building perimeter footings, whichever is greater, encompassing the whole new building footprint, including attached columns.

F. Hand trim excavation. Remove loose matter.

G. Remove lumped subsoil, boulders and rock over 8 inches in largest dimension. Replace with approved fill material and compact as specified.

H. Do not disturb bottom of excavations intended for bearing surface.

I. Scarify bottom of excavation to a depth of 6 inches minimum, moisture-condition to optimum moisture content and compact as specified.

3.7 EXCAVATION FOR PAVEMENTS

A. Cut surface under pavements to comply with cross-sections, elevations, and grades as shown, to subgrade elevations required and to grade tolerances specified.

B. Overexcavate a minimum depth of 24 inches beneath all slabs-on-grade if not part of a building.

C. Overexcavate a minimum depth of 24 inches beneath all paving or 12 inches below proposed pavement sections, whichever is deeper.

D. Scarify subgrade beneath slabs-on-grade to a depth of 6 inches minimum, moisture-condition to optimum moisture content and compact as specified.

E. Scarify subgrade beneath paving to a depth of 6 inches minimum, moisture-condition to optimum moisture content and compact as specified.

3.8 TRENCH EXCAVATION

A. Excavate subsoil required to accommodate storm sewer, sanitary sewer, water, gas, electric and telephone conduits, and other utilities, and piping to municipal or private utilities.

B. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 8 inch clearance on both sides of the pipe.

C. Excavate trenches to depth indicated or required to establish indicated slope and invert elevations.

D. Depth of excavations on the exterior of the building shall provide for the minimum coverage above the top of the pipe, conduit, or tank measured from the lowest adjacent finish grade, as follows unless otherwise indicated on the Drawings:

1.	Steel Pipe and Conduit	24 inches
2.	Copper Water Tube	18 inches
3.	Cast-Iron, Pressure Pipe	36 inches
4.	Plastic Pipe (other than waste)	30 inches
5.	Plastic Waste Pipe	24 inches
6.	Sewer & Storm Drain	18 inches
7.	Irrigation Pipe (pressure)	24 inches
8.	Irrigation Pipe (non-pressure)	12 inches

E. For pipe or conduit less than 4 inches in nominal size, do not excavate beyond indicated depths. Hand-excavate bottom to accurate elevations and support pipe or conduit on undisturbed soil.

F. For pipe or conduit, 4 inches and larger, carry excavation 4 inches below required elevation and backfill with sand bedding to support pipe or conduit.

G. Hand trim excavation. Remove loose material.

H. Excavation cut not to interfere with bearing splay of foundations.

I. At each pipe joint dig bell hole to relieve pipe bell of loads and to ensure continuous bearing of pipe on bearing surface.

J. Remove lumped subsoil, boulders and rock up to 1/3 cu yd measured by volume. Replace with sand bedding material and compact as specified.

3.9 STORAGE OF EXCAVATED MATERIALS

A. Stockpile excavated materials in designated on-site area.

B. Segregate excavated materials based upon intended use.

C. Place, grade, and shape stockpile for proper drainage.

D. Locate stockpile away from edge of excavations.

E. Do not stockpile materials within drip line of trees.

3.10 UNAUTHORIZED EXCAVATION

A. Correct unauthorized excavation at no cost to Owner.

B. Backfill excavation to correct elevation with concrete or approved fill material compacted as specified.

3.11 STABILITY OF EXCAVATIONS

A. Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

B. Machine slope banks to angle of repose or less.

C. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

D. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.

E. Provide shoring and bracing in good serviceable condition.

F. Extend shoring and bracing as excavation progresses.

G. Maintain shoring and bracing in excavations regardless of time period excavation will be open.

H. Provide permanent steel sheet piling wherever subsequent removal of piling would permit lateral movement of soil under adjacent structures. Cut off top of piling 2'-6" below finish grade and leave permanently in place.

I. Design and Calculations: Provide by licensed California engineer in accordance with requirements of the California Building Code and Safety Orders of the State of California, Division of Industrial Safety; Title 8, Division 1, Chapter 4, Subchapter 4, Article 6.

3.12 DEWATERING

A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

B. Grade top perimeter of excavations to prevent surface water from draining into excavations.

C. Do not allow water to accumulate in excavations.

D. Remove water to prevent softening of foundation bottoms and soil changes detrimental to stability of subgrades.

E. Provide and maintain pumps, well points, sumps, suction and discharge lines and other components necessary to convey water away from excavations.

F. Establish and maintain temporary drainage ditches and other diversions to convey rain water and water removed from excavations to runoff areas.

G. Do not use trench excavations as temporary ditches.

3.13 BEDDING OF TRENCHES

A. Support pipe and conduit during placement and compaction of bedding fill.

B. Place a minimum of 4 inches of sand bedding beneath all piping and conduit 4 inches in diameter and larger.

C. Place a minimum of 12 inches of sand bedding above all piping and conduit.

D. Compact sand bedding to density required.

3.14 BACKFILLING

A. Backfill excavations as promptly as work permits, but not until the following has been completed:

1. Acceptance of subgrade.

2. Construction below grade, where applicable, for damproofing, waterproofing, perimeter insulation, and protection board.

3. Inspection, testing, approval and record documentation of location of underground utilities.

4. Removal of concrete formwork.

5. Removal of shoring and bracing if not to be left in place.

6. Backfill of voids in subgrade with satisfactory materials.

7. Removal of trash and debris.

8. Installation of bedding material.

9. Permanent or temporary bracing of horizontally supported walls.

B. Compact subgrade to density requirements for subsequent backfill.

C. Backfill to contours and elevations required.

D. Place geotextile fabric over drainage fill prior to placing backfill.

E. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

F. Place and compact fill material in continuous layers not exceeding specified compacted depth for each layer.

G. Employ a placement method that does not disturb or damage foundation perimeter drainage, foundation dampproofing, foundation waterproofing, protective cover and utilities in trenches.

H. Before placing successive layers, all ruts, and other hollows more than 6 inches in depth shall be regraded and compacted.

I. Maintain optimum moisture content of backfill materials.

J. Backfill against supported foundation walls.

K. Backfill simultaneously on each side of unsupported foundation walls.

L. Backfill trenches with concrete where excavation is less than 3 feet below bottom of footing. Place concrete to level of bottom of adjacent footing. Width of concrete backfill to match width of footing and be full width of trench. Maintain minimum 6 inch encasement on sides, top, and bottom.

M. Place 4 inch thick concrete base slab then backfill trenches with concrete for piping or conduit where top of piping or conduit is less than 30 inches below finished elevation of paving or 18 inches below finished grade. Minimum 6 inches of encasement on sides and top.

N. Remove and replace or scarify and air dry subgrade or fill material that is too wet to permit compaction to required density.

3.15 PLACING TOPSOIL

A. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, in excess of one inch in size.

B. Remove subsoil contaminated with petroleum products.

C. Scarify subgrade to depth of 12 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil. Remove all rocks larger than one inch in size.

D. Place topsoil in areas where seeding, sodding, planting is scheduled.

E. Use topsoil in relatively dry state. Place during dry weather.

F. Fine grade topsoil eliminating rough or low areas. Maintain levels, profiles, and contours of subgrade.

G. Remove stones, roots, grass, weeds, debris, and foreign material while spreading.

H. Manually spread topsoil around trees, plants, and building to prevent damage.

I. Lightly compact placed topsoil.

J. Place compacted topsoil thicknesses for the following various locations:

1. Grass, Seeded: 6 inches.

2. Grass, Sod: 4 inches.

3. Shrub Beds: 18 inches.

4. Flower Beds: 12 inches.

5. Planter Boxes: To within 3 inches of box rim.

3.16 COMPACTION

A. Control soil compaction during construction providing density specified for each area classification.

B. Place and compact fill materials in thin continuous layers as directed by the soils engineer.

C. Provide not less than the specified percentages of density of soil material compacted at optimum moisture content, for each layer of soil material in place.

D. When existing ground surfaces have a density less than that specified for a particular area classification, scarify existing surface to a depth of 6 inches, moisture-condition to optimum moisture content and compact to required percentage of maximum density or as directed by the soils engineer.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Moisture content shall be uniform throughout all layers. Add necessary moisture or aerate soil material at borrow source if it is not possible to obtain uniform moisture content at soil surface at time of placement.

G. When moisture content and condition of each soil layer is satisfactory compact soils to specified density.

H. Compaction of free draining material such as gravel shall be by treads of crawler type tractor, surface vibrator, smooth or pneumatic roller, hand or power tampers.

I. Compaction of soils by use of water jetting or puddling is not an acceptable procedure.

J. Correct improperly compacted areas or layers as directed by Architect if soil density tests indicate inadequate compaction.

3.17 DISPOSAL OF EXCESS AND WASTE MATERIAL

A. Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of legally off site.

B. Remove surplus backfill materials from site and dispose of legally off site.

C. Remove surplus topsoil materials from site and dispose of legally off site.

D. Transport acceptable excess excavated material to designated soil storage area as directed by City.

E. Transport excess topsoil material to designated soil storage area as directed by City.

F. Transport waste material, including unacceptable excavated material, trash, and debris to designated spoil area materials as directed by City.

G. Leave material stockpile areas completely free of excess materials.

3.18 PROTECTION OF WORK

A. Protect finished work under provisions of Section 01 61 00.

B. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.

C. Protect bottom of excavations from freezing, water saturation, and disturbance.

3.19 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 29.

B. Allow testing service to inspect, test, and approve each subgrade and fill layer before further backfill or construction work is performed

C. Laboratory tests and analysis of fill material will be performed in accordance with ASTM D1557 and with Section 01 45 29.

D. In place site tests and analysis of fill material will be performed in accordance with ASTM D1556, ASTM D2937 or ASTM D2922, and with Section 01 45 29.

E. In place site moisture tests will be performed in accordance with ASTM D3017.

F. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

3.20 GRADING TOLERANCES

A. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevation.

B. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.

C. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1/2 inch above or below required subgrade elevation.

D. Building Slab: Grade smooth and even, free of voids, to required subgrade elevation. Final grade tolerance to be within 1/2 inch when tested with a 10 foot straightedge.

3.21 MAINTENANCE

A. Protect newly graded areas. Keep free of trash and debris.

B. Provide erosion control methods to prevent erosion.

C. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances and density.

D. Where completed areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

E. Where settling occurs, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface finish to match adjacent work and eliminate evidence of restoration.

3.22 PLACEMENT SCHEDULE

A. Interior Slab-On-Grade:

1. Existing or imported subsoil and or recycled fill inches thick to subgrade elevation compacted to 95 percent.

2. Cover with gravel fill, compact to 95 percent.

B. Exterior Side of Foundation Walls:

1. Existing or imported subsoil fill, to subgrade elevation, compacted to 95 percent.

C. Fill Under Footings:

1. Existing or imported subsoil and or recycled fill, to subgrade elevation, compacted to 95 percent.

D. Retaining Walls:

1. Existing or imported subsoil fill, to subgrade elevation, compacted to 95 percent.

E. Grass Areas:

1. Subsoil fill, existing or import, to subgrade elevation, compact to 90 percent.

2. Cover with topsoil, existing or import, to finish grade elevation, compact to 90 percent.

F. Planted Areas:

1. Subsoil fill, existing or import, to subgrade elevation, compact to 90 percent.

2. Cover with topsoil, existing or import, to finished grade elevation, lightly tamped.

G. Asphalt Paving:

1. Subsoil fill, existing or import, to subgrade elevation, compact to 95 percent.

2. Cover with aggregate base specified under Section 32 12 16.

H. Concrete Paving:

1. Subsoil fill, existing or import, to subgrade elevation, compact to 95 percent.

2. Cover with aggregate base specified under Section 32 13 13.

I. Concrete Walks, Curbs, and Gutters:

1. Subsoil fill, existing or import, to subgrade elevation, compact to 95 percent.

J. Drainage Pipe:

1. Drainage fill, to below finished grade and above pipe, compact to 90 percent.

2. Wrap drainage fill with geotextile fabric per plans.

3. Remaining fill of subsoil fill, existing or import, to subgrade elevation, compact to 90 percent per soils engineer and soils report recommendations.

K. Utility Trenches on Interior of Building:

1. Sand bedding to 12 inches above pipe, compact to 90 percent.

2. Existing or imported subsoil fill, compact to 90 percent.

3. [Cover with gravel fill, 6 inches thick, compact to 90 percent.

L. Utility Trenches on Exterior of Building:

1. Sand bedding to 12 inches above pipe, compact to 90 percent.

2. Existing or imported subsoil fill, compact to 90 percent.

M. Underground Tanks:

1. Sand fill to centerline of tank radius, compact to 90 percent.

2. Remaining fill of subsoil, existing or import, to required subgrade, compact to 90 percent.

END OF SECTION

SECTION 32 12 16

ASPHALT PAVING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Weed killer.

B. Geotextile paving grid.

C. Prepared base.

D. Headers and stakes.

E. Asphaltic concrete paving.

F. Surface sealer.

G. Pavement striping.

H. Concrete or Recycled composite wheel stops.

1.2 REFERENCES

A. ASTM D979 - Standard Practice for Sampling Bituminous Paving Mixtures.

B. ASTM D2041 - Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.

C. ASTM D2726 - Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.

D. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete In Place by Nuclear Methods.

E. ASTM D3549 - Standard test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.

F. Southern California Chapter, American Public Works Association - Standard Specifications for Public Works Construction.

G. Redwood Inspection Service - Standard Specifications for Grades of California Redwood Lumber.

H. Storm Water Quality Association - Storm Water Best Management Practice Handbook (BMP Handbook) Construction Edition.

I. TAI (The Asphalt Institute) - Manual Series No. 2 (MS-2).

1.3 QUALITY ASSURANCE

A. Perform work in accordance with Standard Specifications for Public Works Construction.

B. Mixing Plant: Conform to State of California standards.

C. Obtain materials from same source throughout.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable City of Costa Mesa standards for paving work on public property.

B. Detectable Warning Surfaces:

1. Detectable warning surfaces shall comply with CBC Section 11B-705.1.

2. Detectable warning surfaces at transit boarding platform edges, bus stops, hazardous vehicular areas, reflecting pools, and track crossings shall be yellow and approximate FS 33538 of Federal Standard 595C. Detectable warning surfaces at other locations shall be either the aforementioned yellow or a color providing a 70 percent minimum visual contrast with that of adjacent walking surfaces. The material used to provide visual contrast shall be an integral part of the surface. CBC Section 11B-705.1.1.3.

3. Detectable warning surfaces shall differ from adjoining surfaces in resiliency or sound-on-cane contact. Such constraint shall not be required for detectable warning surfaces at curb ramps, islands, or cut-through medians. CBC Section 11B-705.1.1.4.

1.5 SUBMITTALS

A. Submit proposed mix design of each class of mix for review prior to commencement of work under provisions of Section 01 33 00.

B. Submit product data for asphalt pavement and seal coat under provisions of Section 01 33 00.

C. Submit manufacturer's instructions for asphalt pavement and seal coat under provisions of Section 01 33 00.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when base surface temperature is less than 40 degrees F.

B. Perform asphalt paving waste management techniques as defined in Section 4 of the Storm Water Best Management Practice Handbook, (BMP Handbook) Construction Edition.

2. PART 2 PRODUCTS

2.1 AGGREGATES

A. Provide aggregates consisting of crushed stone, gravel, sand, or other sound, durable mineral materials processed and blended, and naturally combined.

B. Granular base aggregate: In accordance with Section 200-2.2 of Standard Specifications for Public Works Construction.

C. Granular base aggregate maximum size:

1. Base courses over 6 inch thick: 1-1/2 inches.

2. Other base courses: 3/4 inches.

D. Aggregates for asphaltic concrete paving: In accordance with Section 203.6.2.2. of Standard Specifications for Public Works Construction.

2.2 WEED KILLER

A. Commercial chemical for weed control, registered by EPA. Dry, free-flowing, dust-free chemical compound, nonflammable, not creating a fire hazard when applied in accordance with the manufacturer's recommendations, soluble in water, and capable of being spread dry or in solution.

B. Weed Killer products:

1. Oust: E.I. Dupont de Nemours and Co., www.dupont.com.

2. Casoron 4G: Uniroyal Chemical Co., Inc., www.cromptoncorp.com.

3. Substitutions: Under provisions of Section 01 25 13.

2.3 HEADERS AND STAKES

A. Headers: Construction heart grade redwood in compliance with the Standard Specifications for Grades of California Redwood Lumber.

B. Stakes: Redwood of grade specified for headers.

C. Nails: Common, galvanized, 12d minimum.

2.4 CONCRETE OR COMPOSITE FIBER WHEEL STOPS

A. Prefabricated 5-1/2 inch high x 7-1/2 inch wide x 48 inch long, 3,500 psi concrete wheel stop.

B. Chamfer corners and provide holes for anchoring to substrate.

C. Prefabricated composite recycled parking stops, 3-1/2 inch high x 5-3/4 inches wide x 48 inch long manufactured of a recycled blend of vinyl, nylon and plastic, gray color.

1. Power Stop manufactured by Collins and Aikman, www.powerbond.com.

2. Model STWHLSTD-DS manufactured by Barco Products, www.barcoproducts.com

B. Pre-drill parking stops for two dowel anchors.

D. Dowels: Galvanized steel, 1/2 inch diameter, minimum 12 inch length.

E. Substitutions: Under provisions of Section 01 25 13.

2.5 PAVEMENT STRIPING PAINT

A. Vinyl emulsion type, white color, except at accessible parking spaces, provide blue color. Blue color to be equal to Color 15090 in accordance with Federal Standard 595C.

B. Striping products:

1. W801 Vin-L-Stripe Traffic Paint, manufactured by Dunn-Edwards, www.dunnedwards.com.

2. Substitutions: Under provisions of Section 01 25 13.

2.6 ASPHALTS

A. Comply with provisions of Standard Specifications for Public Works Construction, Section 203-1:

Paving asphalt	:	PG-64-10
Tack coat	:	SS-1h

2.7 ASPHALTIC PAVING MIX

A. Provide hot plant mixed asphaltic concrete paving materials in accordance with Section 203-6 of Standard Specifications for Public Works Construction:

Base Course Mix	:	B
Parking and Drive Area Mix	:	C2

B. Asphalt concrete paving mix to have 5 to 7 percent asphalt cement content by weight in accordance with TAI Publication MS-2.

2.8 SEAL COAT

A. Parking Lot and Drive Areas: Emulsified asphalt and mineral aggregate mix complying with Section 203-9 of Standard Specifications for Public Works Construction, using Type SS-1h asphalt emulsion.

B. Substitutions: Under provisions of Section 01 25 13.

3. PART 3 EXECUTION

3.1 INSPECTION

A. Verify compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

C. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

A. Apply weed killer to entire area to be paved. Follow manufacturer's application directions.

B. Install headers and stakes to achieve arrangement of paving shown on the Drawings.

3.3 PLACEMENT OF GRANULAR BASE COURSE

A. Spread granular base material to compacted thickness shown on the Drawings. Compact according to Section 31 20 00 to 95 percent.

B. Do not displace geotextile paving grid during placement.

C. Thickness tolerance: Minus 0.0 inch to plus 0.5 inch.

D. Smoothness tolerance: 3/8 inch in 10 feet.

1. Deviations: Correct by removing materials, replacing with new materials, and reworking and recompacting as required.

E. Moisture content: Only the amount needed to achieve the specified compaction.

3.4 PLACEMENT OF ASPHALTIC CONCRETE FINISHED PAVING

A. Remove all loose materials from compacted base.

B. Adjust frames and covers, if so required, to meet final grades.

C. Tack Coat:

1. Apply tack coat at the rate of 0.05 to 0.10 gallon per square yard to all existing pavement, curbs, gutters, manholes, and the like immediately before asphalt concrete is placed.

2. Avoid smearing adjacent surfaces. Remove spillage and clean affected areas.

D. Spreading Asphaltic Concrete Materials:

1. Spread material in a manner which requires the least handling.

2. Spread asphalt concrete to compacted thickness shown on drawings.

3. Where thickness of asphalt concrete paving will be 3 inches or less, spread in one layer.

4. Where thickness of asphalt concrete paving will be more than 3 inches, spread in two layers. Surface course shall be a minimum of 1 inch thick.

5. Prime asphalt surface between layers.

6. Offset layers of paving a minimum of 6 inches.

E. Rolling:

1. After material has been spread to proper depth, roll until the surface is hard, smooth, unyielding, and true to the thickness and elevations shown.

2. Roll in at least two directions until no roller marks are visible.

F. Compacting:

1. Average density according to ASTM D2041 to be 92 percent but not less than 90 percent and not more than 96 percent.

3.5 TOLERANCES

A. Free from birdbaths.

B. Flatness, Parking Lot, and Drive Areas: Maximum variation of 1/8 inch in 6 feet.

C. Compacted Thickness: Within 1/4 inch.

D. Variation from True Elevation: Within 1/2 inch.

3.6 REPAVING

A. Where existing pavement is cut, removed, or disturbed, existing pavement shall be saw cut.

B. Where excavations are 12 inches or less in width, existing pavement to be cut 12 inches greater in length and width of excavation.

C. Where excavations are greater than 12 inches in width, existing pavement to be cut 24 inches greater in length and width of excavation.

D. Where existing pavement being cut is to be overlayed, pavement cutting outside limits of excavation is not required.

E. Backfill shall conform to requirements of Section 31 20 00.

F. Repaving shall match existing paving, but shall not be less than 3 inches of asphalt concrete placed upon 12 inches of crushed aggregate base in compliance with Section 200-2.2 of the Standard Specifications for Public Works Construction.

3.7 SEAL COAT

A. Apply seal coat to parking and drive areas in accordance with manufacturer's instructions in two separate coats. Do not apply seal coat until 30 days after initial placement of asphaltic concrete paving.

3.8 PAVEMENT STRIPING

A. Layout line markings and other painting in accordance with Drawings.

B. Clean surfaces to be painted. Apply paint in accordance with manufacturer's directions only when weather conditions permit proper application. Machine apply paint in as many coats as are required to provide opaque markings.

3.9 WHEEL STOPS

A. Place wheel stops at all parking stalls as indicated.

B. Anchor permanently in place with two steel rods.

3.10 FIELD QUALITY CONTROL

A. Field inspection and testing of granular base and of asphalt concrete paving mix will be performed under provisions of Section 01 45 29.

B. Testing firm to take samples and perform tests in accordance with TAI MS-2 and as specified.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

D. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D3549.

E. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

F. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D979.

G. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D2041, and compacted as specified.

H. In-place density of compacted pavement will be determined by testing core samples according to ASTM D2726.

1. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.

2. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D2950 and correlated with ASTM D2726.

I. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.11 PROTECTION

A. Immediately after placement, protect pavement under provisions of Section 01 61 00 from mechanical injury for 2 days.

B. Protect all new placed pavement from landscape irrigation overspray and planter area soil erosion.

3.12 FLOOD TEST

A. Perform flood test of finished paving by use of water tank truck.

B. Where water ponds to a depth of more than 1/8 inch, fill or otherwise correct to provide proper drainage.

C. Feather and smooth edge of fill so that joint between fill and original surface is invisible.

END OF SECTION

SECTION 32 13 13

CONCRETE PAVING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete sidewalks, curbs, gutters, utility slabs, parking areas, driveways, driveway aprons and approaches.

B. Expansion, control and isolation joints.

C. Finishing concrete pavements.

D. Surface treatment with sealer and slip resistant coatings.

E. Aggregate base course.

F. Concrete pavement striping.

G. Concrete or Recycled composite wheel stops.

H. Steel reinforcement.

1.2 REFERENCES

A. 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design.

B. ACI 117 - Standard Specification for Tolerances for Concrete Construction and Materials.

C. ACI 301 - Specifications for Structural Concrete for Buildings.

D. ACI 318 - Building Code Requirements for Structural Concrete.

E. ASTM A184 - Specification for Fabricated Deformed Steel Bar Mats for Concrete.

F. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

G. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.

H. ASTM C33 - Concrete Aggregates.

A. ASTM C94 - Ready Mixed Concrete.

B. ASTM C150 - Portland Cement.

C. ASTM C260 - Air-Entraining Admixtures for Concrete.

D. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

E. ASTM C494 - Chemical Admixtures for Concrete.

F. ASTM C618- Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

G. ASTM C979 - Pigments for Integrally Colored Concrete.

H. ASTM C1116 - Specification for Fiber-Reinforced Concrete and Shotcrete.

I. ASTM C1602 - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.

J. ASTM C1778 - Standard Guide for Reducing the Risk of Deleterious Alkali-Aggregate Reaction in Concrete.

K. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

L. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

M. DSA/AC - Division of State Architect/Access Compliance.

N. National Ready Mix Concrete Association - Plant Certification Program.

O. Southern California Chapter, American Public Works Association - Standard Specifications for Public Works Construction.

P. Stormwater Best Management Practice Handbook (BMP Handbook), Construction Edition, as published by the California Storm Water Quality Association.

1.3 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Obtain materials from same source throughout.

1.4 QUALIFICATIONS

A. Manufacturer: Manufacturer of ready-mix concrete products complying with ASTM C94 requirements for production facilities and equipment. Certified according to National Ready Mix Concrete Association's Plant Certification Program.

B. Pavement Installer: Company who has completed pavement work similar in material, design, and extent to that indicated for this project.

C. Detectable Warning Pavement Installer: Company specializing in applying the work of this section with a minimum of 5 years experience and approved by manufacturer of the detectable warning products used.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable City of Costa Mesa code for paving work on public property.

B. Conform to (CBC) California Building Code, (CCR) Title 24, Part 2, and the latest edition of ADA Standards for Accessible Design for access requirements for individuals with disabilities.

C. Detectable Warning Surfaces:

1. Detectable warning surfaces shall comply with CBC Section 11B-705.1.

2. Detectable warning surfaces at transit boarding platform edges, bus stops, hazardous vehicular areas, reflecting pools, and track crossings shall be yellow and approximate FS 33538 of Federal Standard 595C. Detectable warning surfaces at other locations shall be either the aforementioned yellow or a color providing a 70 percent minimum visual contrast with that of adjacent walking surfaces. The material used to provide visual contrast shall be an integral part of the surface. CBC Section 11B-705.1.1.3.

3. Detectable warning surfaces shall differ from adjoining surfaces in resiliency or sound-on-cane contact. Such constraint shall not be required for detectable warning surfaces at curb ramps, islands, or cut-through medians. CBC Section 11B-705.1.1.4.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Provide concrete curing, finishing, and waste management techniques as defined in Section 4 of the Storm Water Best Management Practice Handbook, (BMP Handbook) Construction Edition.

1.7 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Include data on joint filler, admixtures and curing compounds.

C. Submit proposed mix design to testing laboratory and to Architect for review prior to commencement of work.

D. Submit manufacturer's instructions under provisions of Section 01 33 00.

1.8 SUSTAINABLE DESIGN SUBMITTALS

A. LEED Submittal: Submit data for content of post-consumer and pre-consumer recycled content under provisions of Section 01 81 13.

1.9 MOCKUP

A. Provide mockup of concrete pavement finish under provisions of Section 01 43 00.

B. Construct mockup area under conditions similar to those which will exist during actual placement, with coatings applied.

C. Locate where directed.

D. Mockup may remain as part of the work.

2. PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150 Normal-Type II Portland type, gray color, from single source throughout project.

B. Fine and Coarse Aggregates: ASTM C33, non-reactive when tested in accordance with ASTM C1778 and Appendix X-1 of ASTM C33.

C. Water: ASTM C1602, clean and not detrimental to concrete.

2.2 BASE MATERIALS

A. Aggregate Base: Crushed rock conforming to Section 200-2.2 of the Standard Specifications for Public Works Construction.

2.3 FORM MATERIALS

A. Conform to ACI 301.

2.4 REINFORCEMENT

A. Reinforcing Steel: ASTM A615; 40 ksi yield grade; deformed billet steel bars, uncoated finish.

B. Welded Steel Wire Fabric: Plain type, ASTM A1064; in coiled rolls or flat sheets; uncoated finish.

C. Fabricated Bar Mats: ASTM A184; welded or clip-assembled steel bar mats of ASTM A615, Grade 60 steel bars.

D. Tie Wire: ASTM A1064, annealed steel, minimum 16 gage size.

E. Dowels: ASTM A615; 40 ksi yield grade, plain steel, uncoated finish.

F. Supports: Chairs, spacers, dowel bar supports and other devices for spacing, supporting and fastening reinforcing bars, welded wire fabric, and dowels in place.

G. Secondary Fibrous Reinforcement:

1. Collated, fibrillated, polypropylene fibers for secondary reinforcement of concrete slabs with length varying from 1-1/2 to 2 inches; nylon filamentized fibers of 3/4 inch length; cellulose fibers of 1/8 inch length meeting requirements of ASTM C1116, Type III or IV.

2. Manufacturers:

(a) Forta Mono or Forta, Forta Corp., www.fortacorp.com.

(b) Fibermix or Fibermesh, SI Concrete Corp., www.fibermesh.com.

(c) Nycon, Nycon, Inc., www.nycon.com.

(d) Grace Fibers or Micro Fibers, W.R. Grace and Co., www.graceconstruction.com.

(e) Buckeye Building Fibers, www.ultrafiber500.com.

3. Substitutions: Under provisions of Section 01 25 13.

2.5 ACCESSORIES

A. Curing Compound: ASTM C309, Type 1-D, Class B.

B. Preformed Joint Filler: ASTM D1751, 1/2 inch thick.

C. Clear Sealer: One component alkylalkoxy, silane penetrating sealer.

D. Joint Sealers: As specified in Section 07 92 00.

2.6 ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Surface Retarder: ASTM C494, Type B or D.

C. Fly Ash: ASTM C618, Class F.

D. Water Reducing Admixture: ASTM C494, Type A.

E. Colored Concrete Pigment: ASTM C979 of color selected.

2.7 FINISH MATERIALS

A. Aggregate: Natural river gravel; smooth; 1/4 inch minimum size to 3/8 inch maximum size; clean washed type. No reactive or iron bearing aggregate permitted. Grey color from single source throughout.

B. Slip Resistant Aggregate: 95 percent minimum fused homogeneous aluminum oxide.

C. Chemical Concrete Stain: Penetrating reactive concrete stain and clear sealer of color as selected by Architect. Subject to compliance with requirements provide one of the following:

1. Blush-Tone Acid Stain as manufactured by Rafco Products Co., www.brickform.com.

2. ChlorStain as manufactured by Super Stone, Inc. www.superstone.com.

3. Lithochrome Chemstain as manufactured by L.M. Schofield Co., www.scofield.com.

4. Patina Stain System as manufactured by Symons Corporation, www.symons.com.

5. SGS Concrete Stain as manufactured by Solomon Grind Chemical Services, www.solomoncolors.com.

6. SC-30 Acid Stain as manufactured by Westcoat Specialty Coating Systems, www.westcoat.com.

7. Substitutions: Under provisions of Section 01 25 13.

2.8 DETECTABLE WARNING PAVEMENT

A. Surface applied detectable warning system meeting nominal dimensional and color contrast requirements of the CBC, California Building Code, (CCR), California Code of Regulations, Title 24, Part 2, Section 11B-705 and be approved by DSA/AC.

B. Detectable warning pavement to be constructed using the Vitrified Polymer Composite Armor-Tile System manufactured by Engineered Plastics, Inc., www.armor-tile.com.

C. Color of pavement shall be of contrasting yellow color conforming to Color 33538 in accordance with standard SAE AMS-STD-595.

D. Substitutions: Under provisions of Section 01 25 13.

2.9 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94, Alternative No. 3.

B. Provide concrete of the following characteristics:

1. Driveways, aprons and approaches: Compressive strength of 4,000 psi at 28 days.

2. Sidewalks, curbs, gutters and utility slabs: Compressive Strength of 4,000 psi at 28 days.

3. Slump: 4 inches.

4. Maximum aggregate size: 1 inch.

5. Cement Content: Minimum 520 lbs/cu. yd.

6. Fly Ash: Maximum 20 percent by weight.

7. Air Entrainment: 2 to 4 percent.

8. Water Cement Ratio: 0.50.

C. When automatic machine placement is used, determine mix design and obtain laboratory test results that comply with or exceed requirements.

2.10 PAVEMENT STRIPING PAINT

A. Vinyl emulsion type, yellow color, except at accessible parking spaces, blue color. Blue color to be equal to Color 15090 in accordance with Federal Standard SAE AMS-STD-595. Color of fire lane curb marking to be red with white letters.

B. Acceptable products:

1. W801 Vin-L-Stripe Traffic Paint, manufactured by Dunn-Edwards, www.dunnedwards.com.

2. 506 Traffic Line Paint-Vinyl, manufactured by Frazee, www.frazeepaint.com.

C. Substitutions: Under provisions of Section 01 25 13.

2.11 CONCRETE WHEEL STOPS

A. Prefabricated 5-1/2 inch high x 7-1/2 inch wide by 48 inch long 3,500 psi concrete wheel stops.

B. Chamfer corners and provide holes for anchoring to substrate.

C. Pre-drill parking stops for two dowel anchors.

D. Dowels: Galvanized steel, 1/2 inch diameter, minimum 12 inch length.

3. 3 EXECUTION

3.1 INSPECTION

A. Verify compacted subgrade is ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

C. Beginning of installation means acceptance of existing conditions.

3.2 BASE

A. Prepare and compact base materials in accordance with provisions of Section 31 20 00.

3.3 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of adjacent curbs, gutters, manholes, catch basins, inlets, light pole bases and other fixed objects with form release agent to form isolation joint and prevent bond with paving.

C. Notify Architect minimum 24 hours prior to commencement of concreting operations.

3.4 FORMING

A. Place and secure forms to correct location, dimension, and profile.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint fillers vertical in position, in straight lines. Secure during concrete placement.

3.5 REINFORCEMENT

A. Place reinforcement at mid-height of slabs-on-grade.

B. Lap adjoining pieces of welded wire fabric one full mesh and lace splice with wire. Offset laps of adjoining sheets.

C. Place fabricated bar mats in lengths as long as practical. Overlap adjacent mat 2 inches.

D. Interrupt reinforcement at expansion joints.

E. Place secondary fiber reinforcement in concrete mix in quantities as specified for concrete pavements.

F. Place reinforcement to achieve slab and curb alignment as detailed.

G. Provide doweled joints at interruption of concrete with one end of dowel set in capped sleeve to allow longitudinal movement.

H. Where joining existing concrete pavement, drill and set new dowels with epoxy grout into existing paving. Set opposite end of dowel in caped sleeve to allow for longitudinal movement.

3.6 PLACING CONCRETE

A. Place concrete in accordance with ACI 301.

B. Hot and Cold Weather Placement: ACI 301.

C. Place concrete formwork on public property in conformance with applicable City of Costa Mesa code.

D. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.

E. Place concrete continuously between predetermined construction joints and expansion joints. Do not break or interrupt successive pours such that cold joints occur.

F. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Place concrete to pattern indicated in strip sequence.

H. Curb and Gutter: For automatic machine placement, produce curbs and gutters to required cross section, lines, grades, finish and jointing.

I. Slip - Form Paving: For automatic machine placement, produce paving to required thickness, line, grade, finish and jointing.

3.7 JOINTS

A. Review locations of joints when indicated and make recommendations for any additional joints or suggestions for new locations. Lack of joints or misplacement of joints will not constitute justification of pavement cracking.

B. Place expansion joints at not to exceed intervals to correct elevation and profile per plans. Align curb, gutter, and sidewalk joints.

C. Place joint filler at expansion joints and building or other appurtenances.

D. Provide control joints per plans.

E. Saw cut control joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.

F. Provide keyed joints as indicated.

G. Finish each edge of joint with radiused jointer tool.

H. Use form release agent at isolation joints where paving abutts curbs, gutters, manholes, catch basins, inlets, light pole bases, and other fixed objects to prevent bonding with pavement.

I. Where joining existing pavement, align new expansion, control and isolation joints with previously placed joints.

3.8 FINISHING

A. Uniformly spread, screed and consolidate concrete. Do not spread concrete by vibration.

B. Smooth Form Finish:

1. Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces, with number of seams kept to a practical minimum and in a uniform, orderly pattern.

2. Patch tie holes and defects.

3. Trowel to smooth even finish.

4. Use for curbs, gutters, and mowstrips.

C. Medium Broom Finish:

1. Float surface and trowel to smooth even finish.

2. While surface is still plastic draw a soft fiber bristle broom uniformly over surface in perpendicular direction to traffic.

3. Use for sidewalks, utility slabs, parking areas, driveways, which have a slope of 6 percent or less and areas indicated.

D. Salt Finish:

1. Float surface and trowel to smooth even finish.

2. While surface is still plastic, uniformly broadcast medium salt particles onto surface and imbed into surface using hand trowel. Apply at the rate of one pound of crystals per 10 square foot area.

3. Use for sidewalks which have a slope of 6 percent or less and areas indicated.

E. Medium Sandblast Finish:

1. Float surface and trowel to smooth even finish.

2. Allow concrete to cure for a minimum of 14 days.

3. Perform sandblast finishing in continuous operation utilizing same personnel to maintain continuity of finish.

4. Maintain depth of cut and aggregate exposure to match mockup sample.

5. Wash surface to clean exposed aggregate.

6. Use for sidewalks and areas indicated.

F. Slip Resistant Finish:

1. Float surface and trowel to smooth even finish.

2. While concrete is still plastic, uniformly broadcast aluminum oxide particles onto surface at the rate of 25 pounds per 100 sq. ft.

3. Trowel particles into surface of concrete to provide embedment. Do not force below surface.

4. While surface is still plastic, draw a stiff fiber bristle broom uniformly over surface in perpendicular direction of traffic.

5. Use for ramps with slope of 6 percent or greater, stair treads, and areas indicated.

G. Exposed Aggregate Finish:

1. Float surface of base concrete paving to smooth even finish.

2. While concrete is still plastic, install second course of concrete paving containing aggregates to be exposed. Minimum topping thickness to be 1 inch.

3. Float surface and trowel to smooth even finish maintaining complete coverage of aggregate by sand and cement fines.

4. Apply surface retarder.

5. Begin exposing aggregate as soon as surface can be brushed and hosed without overexposing or dislodging aggregate.

6. Maintain exposure to match mockup sample.

7. Use for sidewalks and areas indicated.

H. Apply colored concrete sealer to colored concrete surfaces in accordance with manufacturer's instructions.

I. Apply clear sealer to sandblast exposed aggregate stamped finished concrete immediately after finishing. Apply in accordance with manufacturer's instructions.

3.9 CHEMICALLY STAINED CONCRETE FINISH

A. Concrete surfaces shall have cured a minimum of 28 days prior to stain application.

B. Apply chemical stain to concrete surfaces as indicated on the drawings.

C. Apply stain evenly over surface in quantities according to manufacturer’s recommendations.

D. Do not apply stain when temperature is above 85 degrees F.

E. Maintain a wet edge on surfaces during application.

F. Remoisten concrete to blend hard edges or lap marks caused by application.

G. Flush area of stain application with mixture of water and baking soda after stain has dried.

H. Prevent water rinse runoff to planted areas or other surfaces that may be damaged by stain residue.

I. Apply manufacturer's recommended sealer to stained surfaces. Apply in accordance with manufacturer's recommendations.

3.10 DETECTABLE WARNING PAVEMENT

A. Install detectable warning pavement on curb ramps and other areas indicated on the drawings.

B. Install detectable warning pavement in accordance with manufacturer's requirements and the 2010 ADA Standards for Accessible Design and CBC, Title 24, Part 2, Section 11B-705 requirements.

3.11 CURING

A. Cure concrete surfaces in accordance with ACI 301.

B. Apply curing compound on finished slab surfaces in accordance with manufacturer's instructions.

3.12 SEALING

A. Apply sealing compound on finished slab surfaces in accordance with manufacturer’s instructions.

3.13 PAVEMENT STRIPING

A. Lay out line markings and other painting in accordance with Drawings.

B. Clean surfaces to be painted.

C. Apply paint in accordance with manufacturer's directions.

D. Apply only when weather conditions permit proper application.

E. Machine apply paint in as many coats as are required to provide opaque markings.

3.14 CONCRETE WHEEL STOPS

A. Place wheel shops at all parking stalls as indicated.

B. Anchor permanently in place with two steel rods.

3.15 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 29.

B. Owners’s Inspector will take cylinders and perform slump, [air entrainment,] temperatures, density, and compressive strength cylinder tests per ACI 301. Preparing compressive strength test cylinder shall be per ACI 301 and the number of cylinders for a valid 28-day compressive strength test shall be determined in accordance with ACI 318, Item 26.12.1 (a). Project Inspector will arrange for pickup by Testing Laboratory.

C. Three concrete test cylinders will be taken for every 50 or less cu yds of each class of concrete placed each day.

D. One slump test will be taken for each set of test cylinders taken.

E. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.16 TOLERANCES

A. Provide tolerances under provisions of Section 01 43 00 in accordance with ACI 117.

B. Maximum Variation of Surface Flatness: 1/4 inch in 10 feet.

C. Maximum Variation from True Position: 1/4 inch.

D. Variation of Pavement Thickness: Plus 3/8 inch, minus 1/4 inch.

E. Maximum Variation of Pavement Joints: 1/8 inch vertical alignment.

3.17 PROTECTION

A. Immediately after placement, protect concrete under provisions of Section 01 61 00 from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit traffic over pavement for 7 days after finishing.

C. Maintain pavement free of stains, discoloration, dirt and other foreign materials. Remove surface stains and spillage of material as they occur.

3.18 REPAIR

A. Remove and replace pavement that is broken, damaged, defective or does not comply with requirements of this Section.

B. Refinishing pavement that is broken, damaged, or defective is not acceptable.

C. Remove pavement in complete sections from joint to joint.

D. Recycle pavement debris under provisions of Section 01 74 19.

END OF SECTION

SECTION 32 31 11

AUTOMATIC SWING GATE

1 . PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electric Gate Operators

B. Parking Gates and Operators

C. Sensors and controls

D. Substitutions: Under provisions of Section 01 25 13

1.2 REFERENCES

A. Underwriters Laboratories (UL): UL 325 – Standard for Safety for Door, Drapery, Gate, Louver, and Window Operators and Systems.

B. Underwriters Laboratories (UL): UL 991 – Standard for Tests for Safety Related Controls Employing Solid-State Devices.

C. American Society Testing Materials (ASTM): ASTM F2200 – Standard Specification for Automated Vehicular Gate Construction.

D. National Electrical Manufacturers Association (NEMA): NEMA ICS 6 – Industrial Control Systems: Enclosures.

1.3 SUBMITTALS

A. Submit product data and manufacturer's installation instructions for each item under provisions of Section 01 33 00.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials and products in strict compliance with manufacturer’s instructions and industry standards.

B. Store products indoors in manufacturer’s original containers and packaging with labels clearly identifying product name and manufacturer. Protect from damage.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Substantial transformation and final assembly shall occur in the United States of America per Section 1605 of the ARRA-09.

B. Installer Qualifications: Installation performed by factory authorized dealer contractor specifically trained in gate operator systems of the type found within this section.

1. Provide documentation of maintenance and repair service availability for emergency conditions.
2. Provide quarterly maintenance for one year following Substantial Completion of the Project.

1.6 WARRANTY

A. Manufacturers standard five (5) year warranty.

2 . PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Doorking, Inc., Model 6100, 120 S. Glasgow Ave, Inglewood, CA 90301, (800) 826-7493, doorking.com.

B. Substitutions: Under provisions of Section 01 25 13.

2.2 SWINGING GATE OPERATORS

A. Microprocessor based solid-state control board interacting with card readers, RF transmitters, access control systems, ticket machines, other activating devices as required, external devices (photo-eyes, contact edges) for entrapment protection and vehicle (loop) sensing systems. Control board shall include built-in close timer (1-25 seconds), dual-gate overlap feature, built-in ports for two (2) plug-in loop detectors, programming switches to set various operating modes, inherent magnetic pulse obstruction sensing reverse system. System shall employ Fail-Safe operation upon primary (AC) power outage.

1. Compliance: Compliant to UL 325, UL 991 and CSA C22.2 No. 247 and listed by Intertek Testing Laboratories NA, Inc. (ETL), a Nationally Recognized Testing Laboratory.

    a. This model is intended for use in Class I, II, III and IV vehicular swing gate applications.

2. Warranty: Five (5) year manufacturer's standard warranty.

3. Maximum Gate Length: 14-feet.

4. Maximum Gate weight: 500 Lbs.

5. Operator speed: 90-degrees in approximately 17 seconds.

6. Frame: G90 hot dipped 10 gage (.134-inch) galvanized steel.

7. Enclosure: Polypropylene .125-inch texture gray.

8. Color: As selected by the Architect from the manufacturer complete color range.

9. Configuration: Left or right hand mount as depicted on the drawings.

10. Mounting:

    a. Post/Pad Mount.

11. Electrical Power Requirements: 115 VAC.

12. Motor: 1/2 HP Continuous Duty Motor.

13. Fail-Safe Operation: Upon loss of primary (AC) power, system shall revert to a fail-safe mode allowing the gate to be pushed open without the use of special knowledge, keys or other releasing mechanisms.

14. Primary Reduction: Adjustable clutch, single cog belt drive train to worm reduction gear.

15. Magnetic Limit Switches: Automatic setting with no mechanical switches to set, wear out or break.

16. Operating Switches: Built-in power (on-off), reset and operating switches.

17. Convenience Outlets: Two (2) 115 VAC for accessory transformers.

18. Entrapment Protection

    a. Photo-electric eye (non-contact sensor).

    b. Sensing edge (contact sensor).

19. Accessories: Provide the optional accessories listed below.

    a. Traffic signal (red / green).

    b. Thermostatically controlled heater kit.

    c. Arm Pivot Assembly – for gates that do not swing in a level plane.

    d. Torsion Rod Assembly – counterbalance for gates that do not swing in a level plane.

    e. Plug-in loop detectors.

    f. Electric reversing edge – reverses direction of gate on contact with an obstruction.

    g. Photo-electric beams – reverses direction of gate if the light beam is obstructed.

    h. Gate Tracker Expansion – provides time and date stamped electronic record of cycles, input errors, loop detector input errors, obstruction hits and power cycles.

    i. Requires companion Doorking 1830 Series access controller.

    j. Backup power inverter – allows system to remain operation upon loss of primary (AC) power.

3 . PART 3 EXECUTION

3.1 INSTALLATION

A. It is preferred that this product be installed by a qualified gate operator technician who is certified by the Institute of Dealer Education and Accreditation (IDEA) or the American Fence Association (AFA).

B. Model 6100 shall be mounted, firmly secured, plumb and level, as required.

C. Wiring shall be uniform and in accordance with national electric codes and manufacturer's instructions.

D. All splices shall be in easily accessible junction boxes or on terminal boards.

E. All cable runs in all junction boxes shall be tagged and identified.

F. Coordinate all work with other effected trades and contractors.

3.2 SYSTEM INITIALIZING AND PROGRAMMING

A. System shall be turned on and adjustment made to meet requirements of specifications and on-site conditions.

B. System shall function as specified.

3.3 SYSTEM PROCEDURES

A. System shall be completely tested to assure that all components and accessories are hooked-up and in working order.

B. System shall be pre-tested by contractor and certified to function in accordance with plans and specifications.

C. System shall be tested in presence of owner's representative.

3.4 OWNER INSTRUCTIONS

A. Installation contractor shall conduct up to (1) hour of instruction in use and operation of the system to designated owner representatives, within (30) days of acceptance.

B. Installation contractor shall conduct up to (1) hour of technical training, in troubleshooting and service of the system, to designated owner representatives within (90) days of system acceptance.

3.5 MANUALS AND DRAWINGS

A. Contractor shall provide owner with (2) copies of standard factory prepared operation, installation and maintenance manuals. Manuals shall include typical wiring diagrams.

B. Contractor shall provide owner with (2) copies of any risers, layouts, and special wiring diagrams showing any changes to standard drawings, if required on project.

3.6 MAINTENANCE

A. The manufacturer recommends periodic maintenance at three month intervals as described in the installation and maintenance manual.

B. External reversing devices should be checked at least once a month.

END OF SECTION

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fence framework, fabric, and accessories.

B. Privacy Screen.

C. Excavation for post bases.

D. Concrete anchorage for posts and center drop for gates.

E. Manual gates and related hardware.

1.2 REFERENCES

A. ASTM A90 - Standards Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.

B. ASTM A392 - Zinc-Coated Steel Chain Link Fence Fabric.

C. ASTM A428 - Weight of Coating on Aluminum-coated Iron or Steel Articles.

D. ASTM A491 - Aluminum-Coated Steel Chain Link Fence Fabric.

E. ASTM F567 - Installation of Chain-Link Fence.

F. ASTM A653 – Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

G. ASTM F668 - Poly (Vinyl Chloride) (PVC) Coated Steel Chain Link Fence Fabric.

H. ASTM F900 - Industrial and Commercial Swing Gates.

I. ASTM A924 – General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

J. ASTM F 1043 - Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.

K. ASTM F1083 - Pipe, Steel, Hot-dipped Zinc-coated (Galvanized) Welded for Fence Structures.

L. ASTM F1184 - Industrial and Commercial Horizontal Slide Gates.

M. ASTM F1043 - Strength and Protective Coatings on Metal Industrial Chainlink Fence Framework.

N. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, California State Accessibility and Egress Standards.

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in commercial quality chain link fencing with five years documented experience.

B. Installation: ASTM F567.

1.4 REGULATORY REQUIREMENTS

A. Conform to disabled person access and emergency egress requirements of the CBC California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

B. Fences, Gates and Hardware:

1. Gates that are part of the accessible route shall meet all the requirements of an accessible door in compliance with CBC Section 11B-404.

2. The levers of lever actuated latches or locks for accessible gates shall be curved with a return to within ½" of the gate surfaces to prevent catching on the clothing or persons. California Referenced Standards Code. T-24 Part 12, Section 12-10-202, Item (F).

3. Swing doors and gate surfaces within 10" of the finish floor or ground shall have a smooth surface on the push side extending the full width of the door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16" of the same plane as the other and be free of sharp or abrasive edges. Cavities created by added kick plates shall be capped. CBC Section 11B-404.2.10.

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00.

B. Include plan layout, grid, spacing of components, accessories, fittings, hardware, anchorages, and schedule of components.

C. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

D. Submit samples under provisions of Section 01 33 00.

E. Submit two samples 12 x 12 inches in size, illustrating fence fabric finish.

F. Submit project record documents under provisions of Section 01 77 00.

G. Accurately record actual locations of property perimeter posts relative to property lines and easements.

2. PART 2 PRODUCTS

2.1 MATERIALS

A. Framework: ASTM F1083; Schedule 40 steel pipe, standard weight, one piece without joints, finish same as fabric.

B. Acceptable Equivalent: ASTM F1043; Group 1A pipe with minimum yield strength of 30,000 pounds per square inch; SS40 as manufactured by Allied Tube and Conduit Fence Division, www.atcfence.com.

C. Fabric: ASTM A392, Class 1, zinc coated wire fabric.

2.2 CONCRETE MIX

A. Concrete: As specified in Section 32 13 13.

2.3 COMPONENTS

A. Line Posts: 2 inch NPS galvanized steel pipe.

B. Corner and Terminal Posts: 3 inch NPS galvanized steel pipe.

C. Gate Posts: 3 inch NPS galvanized steel pipe.

D. Top and Brace Rail: 1-1/4 inch NPS, plain end, sleeve coupled galvanized steel pipe.

E. Fabric: 2 inch diamond mesh galvanized steel wire, interwoven, 9 gage thick, top and bottom selvage knuckle end closed.

F. Caps: Cast steel rainproof, galvanized; sized to post dimension, set screw retained.

G. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings: Galvanized Steel.

H. Tension Wire: 7 gage thick galvanized steel, single strand.

I. Swinging Gates: Constructed of tubular members welded at all corners in conformance with ASTM F900 and the following:

1. Gate Posts: 3 inch NPS galvanized steel pipe for gates up to 8 foot for a single gate or a single leaf of a double gate. 4 inch NPS steel pipe for gates over 6 foot in width.

2. Gate Frames: 1-1/4 inch NPS galvanized steel pipe, for welded fabrication with vertical intermediate brace at maximum 6 foot spacing and horizontal brace on all gates.

3. Gate Fabric: To match adjacent fencing.

4. Gate Hardware: Fork type latch with gravity drop and provision for padlock; Mammoth 180 Hinge / Closure with CLB brackets as manufactured by Locinox, www.locinox.com.

5. Accessible Gate Hardware: As specified in Section 08 71 00.

2.4 PRIVACY SCREEN

A. Material: Coated polyester mesh with brass grommets, and UV resistant, sized to fit mesh specified; with pertaining fastening accessories.

B. Color: As selected by Architect from manufacturer's full range.

2.5 FINISHES

A. Galvanized: ASTM F1043; 1.8 oz/sq ft coating for schedule 40 pipe. ASTM A90; 1.0 oz/sq ft coating for Class 1A pipe.

B. Aluminum Coating: ASTM A428; 0.40 oz/sq ft.

C. Vinyl Coating: ASTM F668, Class 2b PVC coating Black color on galvanized coating.

D. Accessories: Same finish as framing.

3. PART 3 EXECUTION

3.1 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Provide fence of height indicated.

C. Space line posts at intervals not exceeding 10 feet.

D. Set terminal, gate and corner posts plumb, in 12 inch diameter concrete footings with top of footing 6 inches below finish grade. Slope top of concrete for water runoff. Footing depth below finish grade: 42 inches for gate and corner posts, 36 inches for line posts.

E. Provide top rail through line post tops and splice with 7 inch long rail sleeves.

F. Brace each gate and corner post back to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail, one bay from end and gate posts.

G. Install center and bottom brace rail on corner and gate leaves.

H. Stretch fabric between terminal posts or at intervals of 100 feet maximum whichever is less.

I. Do not stretch fabric until concrete has cured 28 days.

J. Position bottom of fabric 2 inches above finished grade.

K. Fasten fabric to top rail, line posts, braces, and bottom tension wire with wire ties maximum 15 inches on centers.

L. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

M. Install bottom tension wire stretched taut between terminal posts.

N. Install gates with fabric to match fence. Install three hinges per leaf, latch, catches.

O. Install accessible gate hardware.

P. Install 10 inch high smooth metal kickplate on each side of accessible gate. Mount 2 inches above finished grade.

Q. Install security screening on accessible gate and on each side of accessible gate a minimum of 4 feet from both hinge and strike sides of gate. Attach screen to fence and gate posts with flat head self-tapping sheet metal screws at maximum 12 inches on center to match hole spacing.

3.2 ERECTION TOLERANCES

A. Maximum Variation from Plumb: 1/4 inch.

B. Maximum Offset from True Position: 1 inch.

C. Components shall not infringe adjacent property lines.

END OF SECTION

SECTION 32 31 30

AUTOMATIC GATES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tubular steel vehicular sliding gates.

B. Operators and automatic controls.

C. Accessories and hardware.

1.2 REFERENCES

A. ASTM A6 - General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use.

B. ASTM A36 - Structural Steel.

C. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.

D. ASTM A366 - Steel, Sheets, Carbon, Cold-Rolled, Commercial Quality.

E. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

F. ASTM F2200 - Standard for Automated Gate Construction.

G. AWS D1.1 - Structural Welding Code.

H. FS TT-P-645 - Primer, Paint, Zinc Chromate Alkyd Type.

I. SSPC - Steel Structures Painting Council.

J. UL325 - Standards for Gate Operators and Systems.

1.3 PERFORMANCE REQUIREMENTS

A. Automatic gates shall comply with safety, performance, and design criteria required by UL 325 and ASTM F2200.

1.4 SUBMITTALS

A. Submit shop drawings under provisions of Section 01 33 00.

B. Submit shop drawings indicating profile and size of gate members, opening configuration, reinforcing, anchorage, size and type of fasteners and accessories.

C. Submit product data under provisions of Section 01 33 00.

D. Submit product data for operator and controls.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit operation data under provisions of Section 01 77 00.

B. Submit operation data for gate controls.

C. Submit maintenance data under provisions of Section 01 77 00.

D. Submit maintenance data for gate operator.

1.6 QUALIFICATIONS

A. Installer: Company specializing in installing the work of this Section with minimum five years documented experience, approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products to site under provisions of Section 01 61 00.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate work under provisions of Section 01 31 00.

B. Coordinate requirements and installation of electrical work.

1.9 WARRANTY

A. Provide one year warranty under provisions of Section 01 77 00.

B. Warranty: Include coverage of gate operator and controls.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS

A. California Gate and Entry Systems, www.californiagate.com.

B. Customline, Inc., www.customlinegateoperators.com.

C. Door King, Inc., www.doorking.com.

D. LiftMaster, Inc., www.liftmaster.com.

E. Substitutions: Under provisions of Section 01 25 13.

2.2 GATE MATERIALS

A. Vehicular Gates and Hardware:

1. Gates: ASTM A500, Grade B, 2 inch x 4 inch x 3/16 inch thick steel tube frame with 1 inch square x 16 gage steel tube pickets at 4 inches on center. Provide additional 2 inch square vertical frame members at third points of overall gate length.

2. Bottom Track: ASTM A36, structural steel angle. 1 x 1 x 1/4 inch continuous angle welded to 4 inch wide x 1/4 inch thick steel plate.

3. Guide Rollers: 6 inch high non-pinch rollers equivalent to Model A UHM by Elite Access Systems.

4. Bottom Wheels: Heat treated steel wheels with needle bearings and grease fittings. Equivalent to Model AH110 by Elite Gates.

5. Perforated Metal: 14 gauge galvanized material with 1/4 inch diameter holes at 60 degrees, staggered 1/2 inch as manufactured by Diamond Manufacturing Company (800) 233-9601.

2.3 GATE EQUIPMENT

A. Operator:

1. Doorking 9210, 1HP. Travel speed of 1 feet per second.

B. Controls:

1. Radio receiver shall be equivalent to and compatible with radio receiver specified in Sections 08 33 23, 08 35 00, and 32 31 11 or:

(a) Receiver Equivalent to Linear Model GRD.

2. Remote Transmitters: specified in Sections 08 33 23, 08 35 00, and 32 31 11 or:

(a) The transmitter shall be equivalent to Linear Model DT with three buttons.

(b) Provide a total of 20 transmitters.

3. Programmable digital control keypad in weatherproof housing, post mounted.

4. Double buried safety loops with vehicle detector on each side of gate.

5. Buried exit loop. Locate as indicated on the drawings.

6. Safety edge recycle switch mounted on leading edge of gate. Equivalent to Miller Edge Model ME123Y. Provide safety edge transmitter equivalent to Multi-Code Model 3022.

7. Knox Key Switch: As specified in Section 11 90 00. Include in post mounted weatherproofing housing.

8. Remote Antenna: mounted on top of gate post.

C. Substitutions under provisions of Section 01 25 13.

2.4 FABRICATION

A. Materials used shall conform to tolerances allowed by ASTM A6.

B. Fabricate items with joints tightly fitted and secured.

C. Fit and shop assemble in largest practical sections, for delivery to site.

D. Ease exposed edges to small uniform radius.

E. Cutting of materials shall be by mechanical means.

F. Welding:

1. AWS D1.1; type required for material used.

2. Surfaces to be welded shall be free from loose seals, slag, rust, grease, paint and other foreign materials.

3. Surface joints shall be free from fins and tears.

4. All welds shall be ground flush and filled to produce a visual continuity of the material surface, i.e. no exposed welding marks.

G. Exposed Mechanical Fastenings: ASTM A307, flush countersunk screws or bolts.

H. Supply components required for anchorage or metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrications.

2.5 FINISH

A. Prepare steel surfaces in accordance with SSPC SP-2.

B. Provide manufacturer's standard lead-free primer selected for compatibility with finish paint system scheduled in Section 09 90 00. Comply with performance requirements of FS TT-P-645.

C. Shop prime all steel members with one coat of prime paint.

D. Finish: Site paint under provisions of Section 09 90 00.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and openings are ready to receive work.

B. Verify field measurements are as shown on shop drawings.

C. Verify that required utilities are available, in proper locations, and ready for use.

D. Beginning of installation means installer accepts existing conditions.

3.2 ERECTION

A. Erect in accordance with manufacturer's instructions.

3.3 ADJUSTING

A. Adjust work under provisions of Section 01 77 00.

B. Adjust gates and equipment to ensure smooth operation.

3.4 DEMONSTRATION

A. Provide demonstration under provisions of Section 01 77 00.

B. Demonstrate gate operation, operator maintenance and control operation.

END OF SECTION

SECTION 32 80 00

IRRIGATION SYSTEM

1. PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. Work Included:

1. All labor, materials, equipment, appliances, fixtures and tests necessary for a new operating irrigation system as indicated on the Contract Drawings or specified in the Project Manual.

2. Repair all street pavements and bases. Contractor shall include in the contract and pay for street damage restoration fee as indicated in Section 01112 - SUMMARY OF WORK**.**

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS in DIVISION

   1 - GENERAL REQUIREMENTS and other Sections of the Project Manual.

2. Landscape Planting 32 93 00

3. Electrical conduit and 120 volt conductors to automatic controller in Section 16100.

4. Water meter and electrical service in Section 01112 – DESCRIPTION OF WORK of DIVISION 1 - GENERAL REQUIREMENTS.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Article 10 - GENERAL REQUIREMENTS of the Project Manual.

B. Make all submittals within 30 calendar days from the issuance of the Notice-to-Proceed.

C. Submit in three (3) complete lists of irrigation materials and equipment, including manufacturer's name and address, specific trade names, catalog numbers complete with illustrations, manufacturer’s recommendation or printed installation instructions, and/or necessary descriptive literature and clearly mark or underline proposed items.

D. Shop Drawings: Required for any irrigation structure as may be specified hereinafter in accordance with provisions of Article 10 - GENERAL REQUIREMENTS.

E. Disapprovals: Contractor is responsible to promptly resubmit, for approval, necessary data concerning a substitution for a previously disapproved item or piece of equipment that may be requested by the Architect

F. Procurement List: Use the approved list of irrigation materials and equipment for procurement without deviation unless otherwise authorized in writing by the Architect.

G. Manufacturer's recommended installation procedure which, when approved by the Architect will become the basis for accepting or rejecting actual installation procedures used on the Work.

H. Manufacturer's specifications and other data needed to provide compliance with the specified requirements.

1.3 QUALITY ASSURANCE

A. Workers: Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

B. Codes and Regulations: All materials and workmanship in this Section shall comply with all applicable City, County and State Plumbing Ordinances, Codes and Regulations.

1.4 GENERAL REQUIREMENTS

A. Approvals by the Architect:

1. All approvals on required submittals hereinafter specified.

2. Approval of all resubmittals requested by the Architect.

B. Inspection: Notify the Architect at least 72 hours prior to time of required inspection.

C. Existing Utilities and Plant Materials: Protect utilities and/or plant materials not designated for removal or modification in place against damage resulting from work of this Contract. Perform any removal and/or modifications only on approval or instruction from the Architect or in accordance with applicable provisions noted or specified. Replace damaged existing plant material with like type and size material. Determine the cost of un-replaceable plant material according to the "square inch" method as described by the Council of Tree and Landscape Appraisers "Manual for Plant Appraisers" Handbook current edition and "Guide for Establishing Values of Trees and Other Plants".

D. Verification of Dimensions and Quantities: Verify site conditions, contract drawings, all dimensions and quantities prior to the bid. Furnish the quantities as may be necessary to do the specific work. Notify the Architect of any discrepancies between the Contract Drawings and the Project Manual and/or execution of the irrigation work prior to the bid. Do not work in areas where such discrepancies occur until further instruction by the Architect.

E. Record Drawings: Comply with provisions of Article 10 - RECORD DRAWINGS of the General Requirements. Accurately dimension location including depths of all piping, valves, and control equipment as installed. Indicate with suitable ink on one set of prints of the Contract Drawings to produce a record of complete installations; to be kept on the job and up-to-date during construction. At the completion of the work and prior to final inspection, the Contractor shall copy his record "as installed" data, using red ink, onto a set of blueline prints. The Contractor shall certify to the completeness and accuracy of the "as installed" information indicated on the blueline prints with his signature. Deliver the signed blueline prints to the Architect for review prior to start of the plant establishment period.

Dimension from two permanent points of reference, building corners, sidewalk, or road intersections, the location of the following items:

1. Connection to existing water lines.

2. Connection to existing electrical power.

3. Gate valves.

4. Routing of sprinkler pressure lines. Indicate dimensional location at 100' intervals max.

5. Sprinkler control valves.

6. Routing of control wiring.

7. Quick coupling valves.

8. Controller.

9. Sleeve locations.

F. Modification of Contract Drawings: In each case where proposed substitute materials or equipment will require, for proper installation, changes to the design of the project as indicated on the Contract Drawings, appropriate proposed Revision Drawings prepared by a licensed Landscape Architect or Engineer shall be furnished by the Contractor for proper installation of the proposed substitute materials or equipment and for construction by all interested trades of the proposed revisions to the project. The cost of the Drawings and of the proposed revised construction shall be borne by the Contractor. Drawings shall be submitted for the Architect's review within 30 days after the issuance of Notice- to-Proceed.

G. Guarantee: General, in accordance with provisions of Section 28 in GENERAL CONDITIONS. Guarantee the entire irrigation system against defects in materials and workmanship for a period of one year from the date of final acceptance of the Project.

1. Should any deficiencies develop within the specified guarantee period due to inferior or faulty material and workmanship, correct such deficiencies to the satisfaction of the Architect without added expense to the City. Further, the contractor shall be required to make any necessary repairs within 24 hours of notification. If the contractor or his agent fail to make such repairs within the stipulated time, the City shall make such repairs or have repairs made by a third party and bill the Contractor for all expenses that accrue from making such repairs.

2. The City reserves the right to make temporary repairs as necessary to keep the irrigation system equipment in operating condition. The exercise of this right by the City will not relieve the Contractor of his responsibilities under the terms of the guarantee.

3. Repair any settlement of backfilled trenches which may occur during a one-year period after final acceptance by the Architect, to the Architect's satisfaction, without expense to the City, including the complete restoration of all damaged planting, paving, or other improvements of any kind.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver products to the job-site in their manufacturer's original containers, with labels intact and legible.

B. Storage: Store piping, materials, fitting, etc. at the job-site where directed by the Architect until such time for installation.

C. Handling: Promptly remove damaged materials and unsuitable items from the job-site and promptly replace with materials meeting the specified requirements, at no added cost to the City.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Provide recently manufactured materials of the best grade of each respective kind.

B. Pipe and Fittings: The type of pipe material and fittings designated on the Contract Drawings, or as hereinafter specified.

1. Steel Pipe: Galvanized standard weight Schedule 40 steel water pipe complying with ASTM A53 - SPECIFICATION FOR PIPE, STEEL, BLACK AND HOT-

   DIPPED, ZINCH-COATED, WELDED AND SEAMLESS; jointed with galvanized, threaded, standard weight malleable iron fittings, and/or couplings. (Kaiser, U.S. Steel, Kelly Pipe, or equal.)

2. Plastic Pipe: High impact rigid polyvinyl chloride PVC 1220 (Type I, Grade 2), conforming to ASTM D1785 - SPECIFICATION FOR POLY (VINYL CHLORIDE) (PVC) PLASTIC PIPE, SCHEDULES 40, 80 120, AND 200, the minimum

   pressure rating to be not less than the working pressures indicated therein for the schedule and size listed. (PVC pipe marked with product standard PS-21-70 conforms to the ASTM requirements.) (Use purple colored pipe for reclaimed water.)

3. All Pipes: To be homogeneous throughout and free from cracks, holes, foreign materials, blisters, deleterious wrinkles, and dents.

4. Use Schedule 40 PVC plastic pipe for pipe sizes up to and including 2 ½ inch for installation on the supply and discharge sides of control valves unless otherwise indicated.

5. Use Schedule 80 PVC plastic pipe only, when threaded joints are specified, or otherwise permitted by the Architect.

6. Continuously and permanently mark all pipes with the following: Manufacturer's name or trademark, size, schedule, and type of pipe, working pressure at 73 degrees F. and National Sanitation Foundation (N.S.F.) approval.

7. Fittings and Couplings for Plastic Pipe: Threaded or slip-fitting tapered socket solvent weld type. Provide threaded adapters with socket pipe for connections to threaded pipe. Plastic pipe fittings and couplings shall be PVC I or PVC I/II material supplied in the same schedule size specified for the pipe. Indicate the type of plastic material and schedule size on each fitting or coupling. Fittings and couplings shall comply with the following specifications. (Use purple colored fittings for reclaimed water.)

   Socket Fittings

   Schedule 40

   ASTM D-2466 - SPECIFICATION POLY (VINYL CHLORIDE) (PVC) PLASTIC PIPE FITTINGS, SCHEDULE 40

   Schedule 80

   ASTM D-2467 - SPECIFICATION FOR POLY (VINYL CHLORIDE) (PVC) PLASTIC PIPE FITTINGS, SCHEDULE 80;

   ASTM D-1785 - SPECIFICATION FOR POLY (VINYL CHLORIDE) (PVC) PLASTIC PIPE, SCHEDULES 40, 80 AND 120

   Threaded Fittings

   Schedule 80

   ASTM D-2464 - SPECIFICATION FOR FOR THREADED POLY (CHLORIDE) (PVC) PLASTIC PIPE FITTINGS, SCHEDULE 80

8. All Other Metal Pipe and Fitting: All metal piping, pipe fittings and nipples consisting brass, copper, bronze, etc. shall comply with appropriate ASTM testing standards including mercurous nitrate test.

C. Valves and Valve Boxes:

1. General: Provide valves of the type and capacity designated on the Contract Drawing and with the requirements specified herein. All valves shall be capable of satisfactory performance at a working pressure of 200 psi. Valve design shall permit disassembly for replacement of seals without removal of the valve body from the pipeline.

2. Shut-Off Valves: In sizes 2-inch and smaller shall be full port ball valves complying with Federal Specification WW-V-35a, have Teflon seats and seals, be corrosion-resistant with two piece body of cast red bronze. The stem shall be silicon bronze with reinforced Teflon thrust washer with blow-out proof design and adjustable packing of Teflon - impregnated asbestos. (Aqua, Crane, Grinnel, Nibco, or equal.) Sizes 2-1/2 inches and larger shall be iron body brass trimmed with other features as per 2-inch size.

3. Manual Control Valves: Brass, straight or angle pattern globe valves, full opening, key operated with replaceable compression disc, and ground joint union on the discharge end. (Nibco or equal.)

4. Automatic Control Valves: Electrically operated, of brass with accurately machined valve seat surface, equipped with flow control adjustment, with capability for manual operation and readily disassembled for servicing; slow opening and closing and self-cleaning. (Rainbird or equal)

5. Hose Bibbs: Brass except for the handle, replaceable compression disc and be 3/4-inch straightnosed, loose key operated, vacuum breaker and pressure rated for operation at 150 psi.

6. Quick-Coupling Valves and Assemblies: Two (2) piece brass self-closing valves with built-in flow control and supplied in 1-inch, unless otherwise required. Quick-coupler assembly shall include the valve, quick-coupler connection, and hose swivel. (Rainbird #44NP-ACME or equal.)

7. Valve Boxes and Covers: Plastic (purple color unless otherwise indicated) minimum 9 1/2 inches x 16 inches x 12 inches or sized as required for easy access and field servicing of the valve. Valve boxes shall have purple covers, permanently embossed with 2-inch high initial identify valve box contents:

Shut-Off Valve	SOV
Remote Control Valve	RCV
Quick Coupler Valve	QC
Manual Control Valve	MCV
Electrical Pull Box	ELEC

8. Pressure Reducing Valve: All metal construction, self-cleaning serviceable type without removing valve body from system and adjustable pressure setting. (Wilkins, Griswold, Clayton, or equal.)

9. Wye-Strainer: Bronze construction fitted with a 20 mesh screen of monel or stainless steel. For sizes over 1" a blow-off cock is required.

D. Backflow Preventer Assembly:

1. A backflow preventer unit as indicated in the irrigation legend with related components conforming to the governing code requirements. (Wilkens, Febco, Neptune or equal.)

2. House backflow preventer in a stainless steel vandal proof enclosure as indicated in the irrigation legend. (Guardshack or equal)

E. Sprinkler Equipment:

1. Sprinkler, Bubbler Heads, and Spray Nozzles: Types and sizes shown on the Contract Drawings, with plastic nozzles unless otherwise indicated.

2. Provide equipment of one type and flow characteristic from the same manufacturer and bearing the manufacturer's name and identification code in a position where they can be identified in the installed position.

3. Provide fixed head sprinklers with a one-piece housing and with provisions for interior parts replacement. Pop-up sprinklers to rise at least 4-inch during operation. Make full or part circle sprinklers interchangeable in the same housing.

4. Spray Head: Adjustable type from full flow to shut-off.

5. Bubbler Head to be pressure compensating type.

F. Automatic Controller Unit: Type as called for on the Contract Drawings. (All units shall meet City and State requirements for “Smart Irrigation” valve timing.)

1. The automatic controllers shall be electrically-timed devices for automatically opening and closing remote control valves, with provisions for manual operation. All controllers and remote control valves supplied under this contract shall be of the same manufacturer and have similar operational and adjustment features.

2. Sized to accommodate the number of stations or control valves included in the system.

3. Each station shall be capable of 7 independent days of programming, selective repeatability and a water budgeting program.

4. Each controller shall be provided with 117-volt and 24-volt circuit breakers, a single receptacle outlet (ground fault interrupter type) and a separate disconnect switch to remove the controller from the power source.

5. Each controller shall contain a station index, a 24-hour time index, and a 7-day index that changes at 6:00 a.m.

6. Each controller shall have the capability of programming 0-to 60-minute watering periods for each station.

7. The station index shall advance directly to stations programmed to water without delay and shall not repeat until the next scheduled starting time.

8. The controllers shall be contained in a louver vented, vandal proof and weatherproof, stainless steel housing with an integral lock and lock cover. Keys for covers shall be interchangeable keys. The controller shall be mounted as indicated on contract Drawings.

G. Conductors:

1. Supply line voltage conductors with THW, 600-volt insulation rating, conforming to the applicable provisions of ASTM D-2219 and 2220.

2. Low voltage control conductors shall be U.L. approved direct burial Type U.F., No. 14 AWG solid copper, unless otherwise required, in accordance with the control equipment manufacturer's recommendation. (Hatfield, Anixter, Cablex, or equal.)

H. All rigid electrical conduit shall be one (1) inch, Schedule 40, galvanized steel, threaded and bushed with packing placed in the ends to protect the wiring. Sweep ends of conduit into pull boxes to make splices.

I. Wire Connectors: Conductors shall be joined by the use of an approved waterproof connector and sealer capable of satisfactory operation under continuous submersion in water. (3-M brand of DBY or DBR Direct Burial Splice Kits, or equal.)

J. Flow Sensor: Where location is shown and detailed on the Contract Drawings, as approved by the “Smart Irrigation” controller manufacturer.)

K. Concrete Thrust Blocks and Anchoring Rods: Provide concrete thrust blocks and anchoring rod where applicable for plastic pipes with 3-inch diameter or larger, and all backflow preventer assembly. The Portland cement concrete used for concrete thrust blocks shall be 470-B-2000 concrete, and the anchoring rod shall be galvanized steel with a minimum of 2@ diameter (wrapped around the pipe).

L. Crushed Rock Sump: Install one (1) inch crushed rock sump, 12" deep in all control or pressure regulator valve boxes and electrical pull boxes. Crush rock shall conform with Section 200-1.2-CRUSHED ROCK AND ROCK DUST of the Standard Specifications for Public Works Construction.

M. Accessories: Provide two each special head wrenches for installing, removing and adjusting each type and make of sprinkler equipment. Provide two keys each for quick coupler valve, and controller units.

N. Subsurface Dripline

1. Rain Bird XFS-09-18 with factory installed, pressure-compensating, inline emitters welded to the inner circumference of the copper colored polyethylene tubing at spacing specified by model number.

2. XF Series insert fittings:

a. Constructed from black acetyl plastic for long-term, leak free connections.

b. Intended for use with polyethylene tubing with ID of 0.536” including Rain Bird XF Dripline.

c. Operating pressure range is 0 to 50 PSI

3. Air Relief Valve Assembly for Subsurface Dripline

a. Rainbird Air Relief Valve, designed for compatibility with Rain Bird XF Series Dripline Tubing.

b. Air Relief Valve Kit; includes 3/4” air/relief valve, Easy Fit compression tee, and Easy Fit flush cap.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until detrimental conditions are corrected.

3.2 IRRIGATION SYSTEM INSTALLATION:

A. General:

1. Perform all work on the irrigation system, including hydrostatic and coverage tests, preliminary operational test of the automatic control system, and the backfill and compaction of trenches and other excavations after topsoil work and before planting.

2. Specimen plants (24-inch or larger size box) will be planted before installing the irrigation system; reroute irrigation lines conflicting with specimen plant locations to clear the root ball, if possible by twenty-four (24) inches.

3. With the Architect’s direction, make adjustments where necessary to conform to actual field conditions unless otherwise noted. Irrigation system layouts shown on the Contract Drawings shall be considered schematic.

4. Make the irrigation system operational with uniform and adequate coverage of the areas to be irrigated, prior to planting.

5. All piping on the Contract Drawings shown in paved areas but running parallel and adjacent to planted areas, are intended for design clarification only and are to be installed in the planted area whenever possible.

6. Connect all piping serving the adjacent to the new irrigation system. Verify with the Architect prior to the start of the work.

7. Make water and utility connections as shown on the Contract Drawings or as designated by the utility company. Replace all sidewalks, curbs or paving removed by the installation of the water and electrical meters and service to the satisfaction of the Architect.

B. Trench Excavating and Backfilling: Size trenches and other excavations to accommodate the irrigation system components, conduits, pipe bedding material and other required facilities. Provide additional space to assure proper installation and access for inspections. Minimum 8-inches side clearance on each side of the pipe or conduit shall be provided in all trenches unless otherwise specified.

1. Unless otherwise specified, the minimum depth of cover over pipelines and conduits shall be as follows:

a. Electrical conduit - 30-inches (36-inches under roadways and parking lots).

b. Other Control Wiring - Depth of waterline or sprinkler line, or a minimum of 24-inches cover if without any waterline or sprinkler line.

c. Waterlines continuously pressurized - 18-inches for mainlines 3” and smaller; 30-inches for mainlines 4” and larger

d. Lateral sprinkler lines - 12-inches.

2. Make the bottom of trenches true to grade and free of protruding stones, roots, or other matter which would prevent proper bedding of pipe or other facilities.

3. Backfill trenches so that the specified thickness of topsoil is restored to the upper part of the trench and compacted to 90% relative compaction.

4. Backfill in the planting area shall be flooded in accordance with Subsection 306-

1.3.3 – JETTED BACKFILL of the Standard Specifications of Public Works Construction.

5. Compact trench backfill through paved areas with each layer, not to exceed the thickness specified in SSPWC Section 306-1-3.2, to 95 percent relative compaction up to designated grade elevations to receive yard or concrete paving and base material.

6. Resurface trenches through paved areas to match existing pavement.

7. No irrigation trenching shall pass closer than eight feet of the base of any tree. No tree root larger than 2-inch diameter shall be cut without approval of the Project Manager.

C. Irrigation Pipeline Installation - General: Execute trench excavating and backfilling, including the depth of cover over the pipeline, in accordance with requirements of Subsection 3.2(B) and SSPWC Section 306-1.2.13, whichever is more stringent.

1. Install pipe fittings in accordance with the manufacturer's recommendations or printed installation instructions before pipe installation. In all pipe trenches, provide minimum 8-inches side clearances.

2. Bed pipe in at least 4-inches of finely divided material or cleaned sand to provide a firm, uniform bearing. Surround the pipe with additional finely divided material or clean sand to at least 12-inches over the top of the pipe. Backfill balance of trench with clean earth material and applicable base material.

3. Deposit trench backfill sufficient to anchor the pipe before the pipeline pressure testing, except that joints shall remain exposed until satisfactory completion of testing.

4. When two or more pipelines are installed in the same trench, separate the pipelines by a minimum horizontal clear distance of 12-inches and a minimum vertical clear distance of 3-inches. Install them so that each pipeline, valve, or other pipeline component may be serviced or replaced without disturbing the other.

5. Assemble all assemblies as specified and in accordance with the manufacturer's directions.

6. During installation of pipe, fittings, valves, and other pipeline components, prevent foreign matter from entering the system. Temporarily cap or plug all open ends at cessation of installation operations.

7. Accomplish changes in pipelines size with reducer fittings. No close nipples or bushings shall be used.

8. Place all lines under paving in Schedule 80 PVC sleeves. Oversize the sleeves sufficiently to house the pipe, fittings and the directed burial control wires, unless otherwise indicated.

9. Dissimilar metals shall be separated by an approved "Dielectric" coupling.

D. Steel Pipe:

1. Square cut and ream pipe ends to full size with a long taper reamer.

2. Cut threads with clean sharp dies.

3. Make joints with a non-toxic, non-hardening joint compound applied to the male threads only.

4. Wrap steel pipe embedded in the ground with seamless 10 mil F.D.S. Safe-T- clad tape.

   a. Spiral wrap pipe with uniform laps. Apply the second layer of wrap in the reverse direction of the first layer of wrap.

5. Joints and any remaining unwrapped portion of the pipeline shall be similarly wrapped after pressure testing.

E. Plastic Pipeline:

1. Join plastic pipe with socket type solvent welded fittings, threaded fittings, rubber ring fittings or by other means specified. Install steel pipe first when plastic pipe is joined to steel pipe.

2. Cut square, externally chamfer approximately 10-15 degrees and remove all burrs and fins.

3. Make solvent welded joints in accordance with ASTM D2855 - PRACTICE FOR MAKING - SOLVENT - CEMENTED JOINTS WITH POLY (VINYL CHLORIDE)

   (PVC) PIPE AND FITTINGS. Use the solvent recommended by the pipe manufacturer.

4. Install plastic pipe in accordance with ASTM D2774 - PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PRESSURE PIPING and the requirements herein.

5. Exercise care in assembling a pipeline with solvent welded joints so that stress on previously made joints is avoided. Handling of the pipe following jointing, such as lowering the assembled pipeline into the trench, shall not occur prior to the set times specified by the manufacturer.

6. Apply solvent to pipe ends in such a manner that no material is deposited on the interior surface of the pipe or extruded into the interior of the pipe during jointing. Wipe off excess cement on the exterior of the joint immediately after assembly.

7. Threads for plastic pipe shall be as specified in Subsection 2.1(B) 7 above. Install a plug in the bore of the pipe to prevent distortion prior to the threading.

8. Make threaded pipe joints using Teflon tape or other approved jointing material. Do not use solvent with threaded joints.

9. Protect pipe from tool damage during assembly. Use vises with padded jaws and strap wrenches for installation of fittings and nipples.

10. Remove and replace plastic pipe which has been nicked, scarred, or otherwise damaged.

11. Snake plastic pipe from side to side in the trench to allow 1-foot of expansion and contraction per 100 feet of straight run.

12. Do not expose the pipeline to water for 24 hours after the last solvent welded joint is made.

F. Installation of Valves, Valve Boxes, and Special Equipment:

1. General: Install all valves and other equipment in strict accordance with the details in a normal upright position, unless otherwise recommended by the manufacturer, and make readily accessible for operation, maintenance and replacement.

2. Install valves of the same size as the pipeline in which they are installed, unless otherwise indicated.

3. Install shut-off valves and sectional control valves below ground; house in a covered valve box that will permit access for field servicing.

4. Install quick-coupler valves and hose bibbs projecting above grade 1-foot from curbs, pavement and walks when possible. In ground cover and shrubbery areas, install quick-coupler valves and hose bibbs as detailed on the Contract Drawings.

5. Set valve boxes and valve markers to finish grade on a minimum 12-inch deep layer of 1-inch size crushed rock and set valves at sufficient depth to provide clearance between the cover and valve handle or key when the valve is in the fully open position. Place crushed rock below valve. Do not cover valve with pea gravel.

6. Provide backflow preventers with pipe supports and the accessories necessary to properly secure the assembly. Assemble backflow preventers with galvanized steel pipe and fittings. Install backflow preventers per prevailing codes, certified by a licensed inspector as required by the County Health Department Test Instructions, Water Pollution Control Section.

7. No equipment shall be installed closer than 12-inches to any paved surface, unless separated from the paved surface by a wall, fence, curb, or similar barrier, or installed underground.

G. Irrigation Head Installation and Adjustment:

1. General: In accordance with the requirements of Subsection 3.2 of this Section, flush and pressure test all mains and laterals, including risers before installing irrigation heads, after which perform a water coverage test.

2. Location, Elevation and Spacing:

a. Do not exceed the maximum irrigation head spacing shown on the Contract Drawings.

b. In new lawn areas, install sprinkler heads 3-inches above finish grade. Before the first mowing, adjust all lawn heads to flush with the final finish grade.

c. Install lawn sprinklers 2-inches clear of adjacent walks, curbs, paving, headers, and similar improvements.

d. Install field shrub sprinkler heads, bubbler heads, and oscillating sprinklers 6-inches above finish grade unless otherwise indicated.

e. Shrub irrigation heads adjacent to curbs, walks, paving, and similar improvements shall be installed on pop-up sprinkler bodies set flush to finished grade.

3. Riser Installation:

a. Install risers perpendicular to finished grade to obtain optimum coverage of the area.

b. All fixed risers shall be of galvanized steel; all swing joint risers shall be Sch. 80 PVC, unless otherwise indicated.

c. Provide threaded pipe between the connection to the lateral or main and the sprinkler head.

d. All riser assemblies shall be double swing joint type.

4. Irrigation Head Adjustment:

a. When all irrigation heads are installed and the irrigation system is operating, adjust and balance each section or unit with all section control valves fully open to obtain uniform 100% head to head coverage.

b. Adjust irrigation heads having adjustable pin nozzles, screws or orifices to provide adequate distribution of water over the coverage pattern. Without additional cost to the City, substitute larger or smaller nozzle cores in sprinkler heads and/or add or omit sprinkler heads as necessary to obtain water coverage which will support healthy plant growth. Any required modification shall not alter the total GPM to a degree to require a major revision of pipe sizing.

c. At no time is the irrigation system to spray water on roadways or cause any erosion to the site.

H. Automatic Control System Installation:

1. General: Install a complete automatic irrigation control system, including the automatic controller, automatic control valves and wiring, and all necessary accessories and utility service connections.

2. Install the automatic controller outside of the coverage pattern of the irrigation system at the location designated on the Contract Drawings. Verify location with Architect prior to installation.

3. Install a separate disconnect switch between the source of power and the controller and a single receptacle outlet (ground fault Interrupter type) as specified herein before. Provide fuse control components in the controller and ground the chassis.

4. Install all service wiring at the minimum depth specified in Subsection 3.2(B) of this Section in Schedule 40 galvanized steel electrical conduit from the service point to the controller. The minimum service wire shall be No. 12 AWG copper 600 volt, Type THW or THWN or larger, as required by the Contract or controller manufacturer. Locate splices only in specified pull boxes and make splices with a waterproof packaged kit approved for underground use. Set pull boxes to finish grade on a 12-inch deep layer of one (1) inch crushed rock.

5. House control wiring in conduit between the controller and an electrical pull box at the base of the controller. House control wire under all yard or concrete paved areas in Schedule 80 PVC waterline pipe sleeve. All other wiring issuing from the electrical pull box shall be direct burial and installed in the main or lateral waterline trenches wherever practical.

   The contractor shall run two extra black control wires from the automatic controller to the farthest valve on the system, or to the farthest valve at each end of the controller area, if the farthest area extends in two directions from the controller. Additionally, run one extra black control wire to each valve manifold. Leave sufficient slack in the wiring to provide for expansion and contraction.

   When the control wiring cannot be installed in a pipe trench, install control wiring a minimum of 18-inches below finish grade and install a bright colored permanent identification band with suitable markings in all pull boxes and near termination of each conductor, in the trench 6-inches below finish grade directly over the wire.

6. Color code all common wire white with all control wire color coded except white. Each valve station wire shall be color coded as follows: red – station 1; yellow – station 2; blue – station 3; green – station 4 orange – station 5; tan – station 6; purple – station 7; pink – station 8; brown – station 9; gray – station 10; repeat for addition station. Make splices in control wire in accordance with the requirements for service wire. Leave at least 2-feet of coiled slack at each splice and point of connection inside of valve boxes.

7. Testing Electrical Components: Field tests shall be performed by the Contractor on all irrigation system conductors in accordance with the requirements specified herein prior to performing the functional tests. Where conductors are installed by trenching and backfilling, such tests shall be performed after at least six (6) inches of backfill material has been placed over the conductors and backfill material has been compacted. Refer to trenching details on the drawings.

   Prior to the start of the functional testing, the Contractor shall perform the following tests on all irrigation system electrical conductors in the presence of the Owner's representative.

   Each circuit shall be tested for continuity and open circuits. Each

   circuit shall be tested for grounds.

   An insulation resistance test at 500-volts DC shall be made on each circuit between the circuit and the ground. The insulation resistance shall not be less than 10-megohms on all circuits.

   The functional test for all the electric automatic irrigation system(s) shall consists of a minimum of fifteen (15) working days of operation during which time the controller shall complete at least three (3) complete cycles automatically for each station. The lengths and frequencies of the cycles will be determined by the City's representative. If unsatisfactory performance of the system develops, the condition shall be corrected and the test repeated until fifteen (15) working days of continuous, satisfactory operation is obtained.

The functional test shall be satisfactorily completed prior to the start of the plant establishment period.

Repair to the irrigation system shall be made within five (5) working days of a malfunction or damage to any portion of the system.

7. Leave the control system in operating condition with an operational chart mounted within the controller cabinet upon completion of the work.

I. Dripline Tubing Installation

1. Stake out dripline irrigation system. Items staked include manifold/header pipe and tubing, sleeves, control zone assemblies, flush valves, air relief valves, and check valves.

2. Dripline Irrigation System Layout Review: Dripline irrigation system layout review will occur after staking has been completed. Notify Landscape Architect one week in advance of review. Modifications will be identified by Landscape Architect at this review.

J. Dripline Excavation, Trenching, and Backfill

1. Excavate and install pipes at minimum cover indicated in drawings or specifications. Excavate trenches at appropriate width for connections and fittings.

2. Minimum cover for dripline components (distance from top of pipe to finish grade):

a. Buried PVC manifold and supply header pipe to dripline grid layouts: 12- inches to top of pipe.

b. Buried dripline lateral pipe downstream PVC manifold and supply header pipe: 4-inches to top of pipe

c. On-grade dripline lateral pipe downstream PVC manifold and supply header pipe: Secure to finish grade with approved tubing stakes. Install and test prior to installation of landscape fabric and mulch.

3. Backfill only after buried lines have been reviewed, tested, and approved.

4. Use backfill free from rubbish, vegetable matter, frozen materials, and stones larger than 2-inches in maximum diameter. Remove material not suitable for backfill. Use backfill free of sharp objects next to pipe.

5. Dress backfilled areas to original grade. Incorporate excess backfill into existing site grades. Dispose of excess backfill off site.

K. Installation of Dripline Irrigation Components

1. Control Zone Kit Assembly:

a. Flush mainline pipe before installing Control Zone Kit assembly.

b. Locate where shown on drawings. Connect control wires to remote control valve wires using specified wire connectors and waterproof sealant. Provide connectors and sealant per manufacturer's recommendations.

c. Install a maximum of one (1) Medium Flow Commercial Control Zone Kits per standard rectangular valve box. Install a maximum of one High Flow Commercial Control Zone Kits per jumbo rectangular valve box.

d. Locate valve boxes at least 12-inches from, and align with, nearby walls or edges of paved areas.

e. Group Control Zone Kit assemblies together where practical. Align grouped valve boxes in uniform patterns. Allow at least 12-inches between valve boxes.

f. Brand controller letter and station numbers on valve box lid in 2-inches high letters.

2. Lateral Piping and Dripline Tubing:

a. Install lateral piping and dripline tubing at locations and in grid patterns as indicated on drawings and installation details, and in strict accordance with manufacturer recommendations.

b. Thoroughly flush PVC lateral piping, supply headers, and dripline tubing immediately upon installation.

3. Air Relief Valve Kit Assembly: Install at all high points in dripline tubing grid as shown and directed on drawings and installation details.

4. Flush Point Assembly: Install in flush header or at ends of each dripline zone segment as shown and directed on drawings and installation details. Install at least 12-inches from and align with adjacent walls or edges of paved areas.

L. Dripline Record (AS-Built) Drawings

1. Document field changes from original design and construction documents. Maintain on-site and separate from original construction documents, one complete set of documents labeled “Project Field Documents”. Keep documents current. Do not permanently cover work until accurate “as-built” information is recorded.

2. Record pipe network alterations on a daily basis. Record work that is installed differently than shown on construction documents. Record accurate reference dimensions, measured from at least two permanent reference points, of each control zone kit assembly, each dripline zone boundary, each air relief valve assembly, each flush point assembly, and other dripline irrigation components enclosed within valve box.

3.3 FLUSHING AND TESTING

A. Flushing: After completion, and prior to the installation of any terminal fittings, thoroughly flush the entire pipeline system to remove dirt, scale, or other material. After flushing, conduct the following tests in the sequence listed below. Provide all equipment, materials, and labor necessary to perform the tests. Conduct all tests in the presence of the City Inspector.

1. Pipeline Pressure Test: Perform a water pressure test on all pressure mains and laterals before any couplings, fittings, valves, and the likes are concealed. Cap all open ends after the water is turned into the line in such a manner that all air will be expelled. Test pressure mains with all control valves to lateral lines closed. After the pressure main test, open all valves to test lateral lines. The constant test pressure and the duration of the test are as follows:

    a. Mains: 24 hours at 125 psi.

    b. Laterals: 2 hours at 100 psi.

2. Sprinkler Coverage Test: Perform the coverage test after sprinkler heads have been installed and demonstrated that each section or unit in the irrigation system is balanced to provide uniform and adequate coverage of the areas serviced. Correct deficiencies in the system in accordance with the requirements of Subsection 3.2(G)4.

3. Operational Test: Evaluate the performance of all components of the automatic control system for manual and automatic operation. During the maintenance period, and at least 15 days prior to final inspection, set the controller on automatic operation so that the system will operate satisfactorily during such period. Make all necessary repairs, replacements, and adjustments until all equipment, electrical work, controls, and instrumentation are functioning in accordance with the Contract Documents.

3.4 OPERATING MANUALS AND EQUIPMENT

A. Furnish the City with four bound copies of operating and maintenance manuals for all irrigation system equipment such as automatic controller.

B. Explain in detail all irrigation equipment operations, watering schedule and maintenance procedures to the City personnel directed by the Inspector and City Engineer before completion of the project.

C. Provide the City with a reduced legible copy of the "As-Installed" Irrigation Plan hermetically sealed in a plastic cover to be affixed inside the controller cover.

END OF SECTION

SECTION 32 93 00

LANDSCAPE PLANTING

1. PART 1 GENERAL

1.1 DESCRIPTION

A. Work Included:

1. All labor, materials, equipment, and appliances necessary to provide demolition; planting of new trees, plants, shrubs, vines, and ground cover; tree pruning and all required testing and inspections; maintenance of new trees, plants and ground cover as indicated on the Contract Drawings, specified herein and as needed for complete and proper installation and maintenance.

B. Related Sections:

1. Documents affecting work of this Section include, but are not necessarily limited to the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, in

   DIVISION 1 - GENERAL REQUIREMENTS and other Sections of the Project Manual.

2. Irrigation System in Section 32 80 00.

1.2 SUBMITTALS

A. Comply with provisions of Section 11 - SHOP DRAWINGS AND MANUFACTURER'S DATA of the General Conditions and Section 01330 - SUBMITTALS of DIVISION 1 - GENERAL REQUIREMENTS of the Project Manual.

B. Make all submittals within 90 calendar days after the Notice-To-Proceed.

C. Submit three (3) copies of the following:

1. Complete lists of landscape materials and equipment including nursery's and manufacturer's names and address, specific trade names, catalog numbers and estimate quantity; complete with illustrations and/or photographs and descriptive literature and clearly mark or underline proposed items; list sources of landscape soils, and provide an agronomic soil tests on any imported soil.

D. Shop Drawings: Required for any landscape structure as may be specified hereinafter in accordance with provisions of Section 11 - SHOP DRAWINGS AND MANUFACTURER'S DATA and Section 01330 - SUBMITTAL in DIVISION 1 - GENERAL REQUIREMENTS.

E. Disapprovals: Promptly resubmit for approval necessary data concerning a substitution for a disapproved item.

F. Procurement List: Use the approved list of landscape materials and equipment for procurement without deviation unless otherwise authorized in writing by the Architect.

G. Work Certification And Project Closure: Prior to job acceptance, written certifications accompanied with material invoices and following submittals, shall be submitted to the Architect. Each invoice shall list on the original, the job name and delivery address. The following submittals, but not necessarily limited to, shall be made:

1. Copy of soil analysis from certified soil laboratory as outlined under Section 01330 - SUBMITTALS.

2. Quantity and type of commercial and organic fertilizers.

3. Quantity and type of all specified soil amendments.

4. Quantity and type of planting tablets/tree stakes/root barriers.

5. Quantity and type of herbicides and pesticides and their application program and registered labels.

6. Record Drawings and Record Project Manual for the irrigation and planting works.

7. Controller charts.

8. Results of mainline pressure testing (see irrigation specifications).

9. Modified Watering Schedules (if applicable).

10. Maintenance Log and Maintenance Schedules.

H. Bonds: Furnish a faithful performance bond in the amount specified in the Contract Documents required to cover the guarantees per Section 3.9.

1.3 QUALITY ASSURANCE

A. Workers: Use adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

B. Codes and Regulations: All materials and workmanship in this Section shall comply with the City of Orange Building Code and Amendments, County, Federal and State Codes and Regulations. Contractor shall also comply with all referenced sections of the latest edition of the Standard Specifications for Public Works Construction (SSPWC).

C. Quality and Size: Comply with current edition of the "Horticultural Standards" for number one nursery stock as adopted by the "American Association of Nurserymen".

D. All Plants:

1. Shall be true to name, size and growing specifications with the names, standards and practices in "American Association of Nurserymen".

2. In all cases, botanical names take precedence over common names.

1.4 GENERAL REQUIREMENTS

A. Approvals by the City Engineer:

1. All required agricultural suitability and fertility analysis or testing, and weed/pest control prior to placing top soil or soil amendments.

2. All work on sprinkler irrigation system prior to start of landscaping work.

3. All reviews on required submittals hereinafter specified.

4. All resubmittals requested by the Architect.

B. Inspection: Notify the City Inspector and/or other required local governing agency at least 72 hours prior to time of the following required inspections:

1. All subgrade and fill works.

2. All weed/pest control and soil fertilizing and conditioning.

3. All plant material at time of delivery to the job-site.

4. All trees (15 gallon can size and larger) at their source prior to delivery to the job- site or elsewhere as may otherwise be directed by the City Inspector or specified. All trees shall be tagged by the Architect or authorized representative with their signature.

5. All landscaping construction items prior to start of maintenance or plant establishment period.

C. Existing Utilities and Plant Materials: Protect utilities and/or plant materials, not designated for removal or modification, in place against damage resulting from work of this Contract. Perform any removal and/or modifications only on approval or instructions from the City Inspector or in accordance with applicable provisions noted or specified on the Contract Drawings or in other sections of the Project Manual**.** Replace damaged existing plant material with like type and size material. Determine the cost of irreplaceable plant material according to the "square inch" method as described by the Council of Tree and Landscape Appraisers, GUIDE FOR PLANT APPRAISAL, current edition.

D. Verification of Dimensions and Quantities: Verify all dimensions and quantities prior to start of work. Furnish the quantities as may be necessary to do the specific work. Promptly notify the Architect of any discrepancies between the Drawings and the Project Manual and/or actual job-site conditions which would affect the proper execution of the landscaping work. Do not work in areas where such discrepancies occur until further instructed by the Architect.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Notify the Architect of the delivery a minimum of 48 hours in advance so the plant materials may be inspected upon arrival at the job-site. All plant material judged by the Architect as unacceptable shall be removed immediately from the job-site by the Contractor. All trees not accompanied with the tags signed by the Architect or the authorized representative**,** or required plant pathologist/horticulturist; or plant not correspondent with contract requirements shall be rejected and immediately removed from the job site.

2. Protect plants during delivery against damage to root balls or desiccation of leaves. Protect trees during transport by tying in the branches and covering all exposed branches.

3. Deliver fertilizer to the job-site in the original and unopened containers bearing manufacturer's guarantee chemical analysis, name, trade mark or trade name in conformance with Federal and Local law. In lieu of containers, fertilizer may be furnished in bulk and a certificate indicating the above information shall accompany each delivery.

4. During delivery, protect sod from drying out and from contaminants.

B. Storage:

1. Store plants, trees, etc. at the job-site where directed by the City Inspector.

2. Keep fertilizer in dry storage away from contaminants. Loose fertilizers and soil amendments shall be kept covered with a tarp.

3. Store plants not installed on the day of arrival at the job-site as follows:

a. Outside storage to be protected from wind.

b. Keep plants in containers in a moist condition until planted by watering with fine mist spray.

C. Handling: Transport and handle plants with care to ensure protection against injury.

2. PART 2 PRODUCTS

2.1 MATERIALS

A. General: All landscaping materials for soil conditioning, weed or pest control, or planting shall be first grade, commercial quality and shall have certificates.

B. Topsoil: Designated as "Imported/Class A" or "Unclassified/Class C" as specified herein. The City Inspector or authorized representative shall determine the suitability of topsoil prior to use. Transport topsoil from the source to its final position unless stockpiling is specified.

1. "Imported/Class A" Topsoil: From a source outside the limits of the project selected by the Contractor and in compliance with Inspection requirements specified in General Conditions. Within 90 days after Notice-To-Proceed submit the proposed source of topsoil to the Architect for approval. After the Architect or authorized representative makes an initial inspection at the site of the proposed imported material, the Contractor shall perform the required tests as deemed necessary to determine that the material meets the requirements. The Contractor shall submit to the Architect a written report of a soil testing laboratory registered by the State of California for agricultural soil evaluation which states that the proposed source complies with this Section, and proposed soil amendments. After the testing report and proposed soil amendments are reviewed by the Architect, the Contractor shall comply with all the recommendations of the soil testing laboratory and add any additional soil amendments necessary to achieve proper nutrient levels to support a healthy plant growth, at no additional cost to the City.

"Imported/Class A" topsoil shall be of a uniform composition and structure, fertile and friable sandy loam garden soil, and be free of roots, clods and stones larger than1-inch in greatest dimension, pockets of coarse sand, noxious weeds, sticks, brush and other litter and not be infested with nematodes or other undesirable insects and plant disease organisms.

"Imported/Class A" topsoil shall meet the following additional requirements.

a. Gradation Limits: Sand - 50-80 percent, clay - 20 percent maximum, and silt - 30 percent maximum. The sand, clay and silt gradation limits shall be as defined in ASTM D-422 – TEST METHOD FOR PARTICLE – SIZE ANALYSIS OF SOILS.

b. Permeability Rate: Hydraulic conductivity rate shall be not less than one inch per hour nor more than 20-inches per hour when tested in accordance with the USDA Handbook Number 60, method 34b or other approved methods.

c. Agricultural Suitability and Fertility Analysis Tests: The topsoil shall be fertile and friable garden soil suitable for sustaining and promoting the growth of the specified plants. The topsoil shall comply with maximum permissible element concentration.

2. "Unclassified/Class C" Topsoil: Prior to any excavation, grading or fill works; the Contractor shall take two (2) test samples of the on-site soils at the locations and depths as specified and directed by the City Inspector or authorized representative. The soil samples shall be analyzed for agricultural suitability and fertility. The Contractor shall submit a written report of a soil testing laboratory registered by the State of California for agricultural soil evaluation and proposed soil amendments to the Architect for approval. Soil Amendments shall be added in accordance to the soil testing laboratory recommendations. The Contractor shall include in the construction schedule sufficient time for the testing processes and the grading work.

C. Fertilizers and Conditioning Materials: Comply with the applicable requirements of the State Agricultural Code. All fertilizing materials shall be packaged, first grade, commer- cial quality products identified as to source, type of material, weight and manufacturer's guaranteed analysis. Fertilizing material shall not contain toxic ingredients or fillers in quantities harmful to human, animal, or plant life.

The Contractor shall submit a certificate of compliance stating that the material substantially complies with the Project Manual, in accordance with provisions of Subsection 1.2(b) hereinbefore specified.

1. Bone Meal: Commercial raw bone meal shall be finely ground, steamed dry material with a minimum analysis of 2.5 percent nitrogen and 22 percent phosphoric acid.

2. Agricultural Gypsum: Hydrated calcium sulfate product containing 23 percent calcium and 18 percent sulfur with a guaranteed analysis of 84 percent calcium sulfate.

3. Soil Sulfur: Guarantee analysis of 99 percent sulfur.

4. Superphosphates: First-grade finely ground phosphate rock used for agricultural purpose, containing minimum 18 percent phosphoric acid by volume.

5. Commercial Fertilizer: Slow-release pelletized or granular product having a chemical analysis as per the recommendations of the certified soils laboratory report as outlined in this Project Manual, free-flowing material delivered in unopened sacks. Do not use material, which becomes caked or otherwise damaged. Shall have a minimum analysis of 1-1.3-5 (N-P-K), derived from rock phosphate, peat moss, chicken manure, sand, sulfate of potash, gypsum, and EDDHA chelate.

6. Organic Soil Amendment: Organic Soil Amendment shall be selected products as described herein.

a. Type 1 Organic Soil Amendment shall be a ground of processed wood product derived from Redwood, Fir or Cedar sawdust, or from the bark of Fir or Pine treated with a non-toxic agent to absorb water quickly and shall comply with the following requirements.

GRADATION	
Sieve Size	**Percent Passing**
1/4-inch	95% minimum
#8	80% minimum
#35	30% maximum
Nitrogen Content	**%, Dry Weight**
Redwood	0.4 - 0.6%
Fir	0.56 - 0.84%
Cedar	0.56 - 0.84%
Fir Bark	0.8 - 1.2%
Pine Bark	0.8 - 1.2%

Salinity: Maximum saturation extract conductivity 2.5 millimhos/centimeter at 25 degrees Celsius.

Wetability: When one teaspoon of tap water is applied to 4 cubic inches of the air-dried products, the material shall become completely damp in a period not exceeding 2 minutes.

b. Type 2 Organic Soil Amendment shall be a relatively dry friable organic composite derived from sewage sludge processed for agricultural use. It shall contain at least 1-percent nitrogen by dry weight and comply substantially with the gradation for Type Organic 1 Soil Amendment.

c. Type 5 Organic Soil Amendment shall be seasoned tree chip mulch, free of all foreign matter including weed and tree seeds. Chip size shall be a minimum one 1-inch in diameter and not more than two 2-inches in diameter. Contractor shall submit sample to City Engineer prior to application.

All Organic Soil Amendment shall conform to the following criteria:

a. Humus material shall have an ash content of no less than 8% and no more than 50%.

b. The pH of the material shall be between 6 to 7.5.

c. The salt content shall be less than 10 millimho/cm at 25° C. (ECe less than 10) on a saturated paste extract. If the ECe exceeds 10 millimho/cm, the maximum rate of use shall not exceed 15% by volume.

d. Boron content of the saturated extract shall be less than 1.0 parts per million.

e. Silicon content (acid-insoluble ash) shall be less than 20%.

f. Calcium carbonate shall not be present if to be applied on alkaline soils.

g. Sludge-based materials are not acceptable if the soil already has a high level (toxic level) of zinc, copper or other heavy metals based on soil analysis.

h. Carbon: Nitrogen ratio is less than 25:1.

i. All compost shall be aerobic without malodorous presence of decomposition products.

j. Maximum total permissible pollutant concentrations in amendment in parts per million on a dry weight basis:

Arsenic	20	Copper	150	Selenium	50
Cadmium	15	Lead	200	Silver	10
Chromium	300	Mercury	10	Vanadium	50
Cobalt	50	Molybdenum	60	Zinc	300
Nickel	100				

Higher amounts of salinity or boron may be present if the soils are to be preleached to reduce the excess or if the plant species will tolerate the salinity and/or boron.

7. Fertilizer Tablets shall be tightly compressed, long lasting, slow release tablets derived from urea, methylene ureas, calcium phosphate, potassium sulfate, calcium sulfate, magnesium oxide, sodium borate, copper sulfate, iron sulfate, manganese sulfate, and zinc oxide. N-P-K shall be 20-10-5. Tablet size shall be 21 grams. Rate and application shall be per these specifications and Contract Drawings.

D. Plant Materials

1. General: The plant names shown or listed on the Contract Drawings shall conform to the "Sunset, Western Garden Book", latest edition; grown in the State of California, unless otherwise specified.

a. Type and Size: Plant materials shall be as listed on the Contract Drawings, unless otherwise instructed by the Architect.

b. Tag one plant of each variety for identifying purposes.

c. All plants shall be inspected and approved prior to planting as per provisions of Subsection 1.4(B) hereinbefore specified.

d. Substitutions: When plants of a specified kind or size are not available, substitution may be made upon approval by the City Engineer, in accordance with Section 12 - REFERENCE TO TRADE NAMES of the General Conditions and Section 01330 - SUBMITTAL. Contractor shall provide information regarding his attempts to locate such material.

e. All plants shall have a growth habit normal to the species in accordance with U.S.A. Standards for Nursery Stocks, latest editions; shall be sound, healthy, vigorous and free from insect pests, plant disease, sun scalds, fresh bark abrasions, excessive abrasions or other objectionable disfigurements. Tree trunks shall have normal well-developed branch systems, and vigorous and fibrous root system, not root bound and shall be free of kinked or girding roots.

f. Other than normal side pruning during the growth period, no pruning shall be done prior to inspection at the nursery.

g. Plant materials specified for adverse site conditions shall be site acclimated prior to planting, either through purchase from local nurseries or site storage for a period appropriate to the project region. Six weeks shall be considered a minimum time period, but the final decision is based upon the specific plant.

2. Plant Material:

a. Trees: All trees shall conform to types, sizes and heights noted on the Contract Drawings. All trees shall be measured for height from the root crown to the last division of the terminal leader and measured for the diameter 3-feet above the root crown. All palm trees shall be measured for height from the root crown to the brown trunk and measured for the diameter 3-feet above the root crown. Trees and palms shall stand erect without support.

b. Container Plants: Specified type and size selected from high quality well- shaped nursery stock.

c. Shrubs: Specified type and size selected from high quality well-shaped nursery stock.

E. Construction Materials: (As Applicable)

1. Lumber: "Construction Heart-Rough Redwood" of sizes specified or noted on the Contract Drawings or Recycled Plastic Lumber as noted on the contract Drawings.

2. Steel Pipe: Galvanized steel, Standard Weight (Schedule 40) complying with ASTM A53 - SPECIFICATION FOR PIPE, STEEL, BLACK AND HOT-DIPPED, ZINC-COATED, WELDED AND SEAMLESS.

3. Nails, Fasteners, Etc.: Hot-dipped galvanized and commercial quality materials.

4. Fabricated Metal Items: Steel conforming to ASTM A36 - SPECIFICATION FOR CARBON STRUCTURAL STEEL.

5. Concrete Items: Standard 2,500 psi concrete as per City Building Code and applicable amendments or as provided in Section 03300 - CAST-IN-PLACE of the Project Manual.

6. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

F. Header Board and Mow Strip:

1. Concrete Mow Strip: 8-inches square x 6-inches in depth, complete with tooled control joint 10-feet apart; at the beginning and end of curve, and at changes of direction; and where header abuts an existing or new structures and improvements, or as indicated on the Contract Drawings.

G. Tree Stakes:

1. Tree Staking: As designated on the Contract Drawings or herein.

   Wood tree stakes 2-inches in diameter by 10-feet long, lodgepole grade, pressure treated, capable of standing in the ground at least two years.

H. Tree Ties: Contractor shall use ties indicated on the drawings. No hose and wire ties will be accepted:

I. Root Barrier: Install root barrier in all tree planters where tree is within five 5-feet of paving.

J. Pesticides/Herbicides:

1. Pre-Emergent Herbicides: Selected from the broad spectrum of commercial brands available subject to approval by the Architect and not in conflict with the fertilizing and conditioning materials and any regulations governing its use. (Balan Granular, or equal.)

2. Post-Emergent Herbicides: Comply to all governing regulations and subject to approval by the Architect. Contractor shall identify the location of each proposed usage of Post-Emergent Herbicide. Post-Emergent Herbicide shall be type recommended or suitable for each plant material. Roundup, or approved equal shall be used for non-selective weed control.

3. Unless prohibited by the County Agricultural Commissioner, pesticides may be used for planting work. Usage of pesticides and herbicides shall conform to the requirements of the California Food and Agricultural Code and requirements. Weed oil and granular or pellet forms of pesticides shall not be used.

4. The contractor shall abide by all laws and codes governing weed abatement operations including but not limited to CAL-OSHA requirements and the State of California Healthy Schools Act of 2000 (AB2260), herein called “Schools Act.”

3. PART 3 EXECUTION

3.1 GENERAL

A. The Landscape work shall not be performed at any time when it may be subject to damage by climatic conditions.

B. The Contractor shall verify all dimensions shown on the Contract Documents and at the site.

C. In case of conflict between the plant schedule totals and total plant count of the contract documents, the Contractor shall provide the higher number of plants.

D. Delivery of material shall begin only when it is ready for the work and after the inspections are made and the required samples and tests have been reviewed by the Architect. All materials furnished for the work shall be not less than the reviewed sample.

E. The Contractor shall provide temporary fencing, barricades, covering, or other protection to preserve existing landscaping items indicated to remain and to protect the adjacent properties and other structures from damages by the landscape and other contract work.

F. The Contractor shall remove and/or relocate landscape items such as trees, shrubs, grass, other vegetation, improvements, and obstructions as shown on Drawings or specified otherwise. Plant material to be removed shall be disposed of off the site in a legal and proper manner.

3.2 SURFACE CONDITIONS

Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until detrimental conditions are corrected.

3.3 AGRICULTURAL SUITABILITY AND FERTILITY ANALYSIS TESTS

A. General: Except noted otherwise Contractor shall submit the proposed Imported/Class A Topsoil for Agricultural Suitability and Fertility Analysis. Contractor shall after completion of all rough grading operations sample all remaining on-site soil proposed to be used for top soil. The Contractor shall obtain the number of soil samples as specified and submit them to a certified soil laboratory for required soil analysis. The location of the soil sample and intent of the soil analysis are to provide the following:

1. Accurate soil amendment and fertilizer recommendations with regards to type, quantity and procedure to create planting soil for plant material which includes trees, shrubs, ground covers and turf.

2. Identify any potential problems in the relationship between specified of plant materials and existing soil conditions that may ultimately affect plant growth.

B. Samples shall be taken by a technician from certified soil laboratory. Recommendations for appropriate location, quantity, and method of obtaining samples shall be submitted by a certified technician and reviewed by the Architect**.**

1. Sample Taken For On-Site Soil after Completion of Grading or Clearing Operations:

a. Stockpile: Unless specified otherwise, take representative samples at locations and desired depth as directed by City Inspector.

b. For New Planting: Sample shall be taken 6-inches below proposed topsoil for ground cover; 6-inches below proposed top soil for shrubs; 6- inches below proposed top soil for small boxed trees; and 6-inches below proposed top soil for larger boxed trees.

2. For on-site soil, use a soil probe or soil anger to remove a core samples. Otherwise use a shovel to dig a hole to the desired depth. Sample the soil from the side of the hole by scraping it with a trowel. The tools need to be clean and not rusty. Avoid sampling when the soil is to wet.

3. Sample Taken For Import Top Soil: Unless specified otherwise, two (2) samples shall be taken at the source with the accompany of City Inspector or the authorized representative after initial site inspection is made and submittals are reviewed.

C. Contractor shall provide the Architect with a copy of the completed report on laboratory letterhead for review, in accordance with Section 11 - SHOP DRAWINGS AND MANUFACTURER'S DATA of the General Conditions prior to planting commencement.

D. Submitted recommendations shall include soil amendments and fertilization for initial planting, as well as any measures to be taken during the plant establishment period. Submittal shall include a narrative explaining the criteria employed to determine the soil sampling sites.

E. Agricultural Suitability and Fertility Analysis:

1. Must include pH measurement in the Saturation Extract, Electrical Conductivity of the saturation extract and Sodium Adsorption Ratio of the saturation extract. The approved procedures are the following:

pH	Method 21
Saturation Extract	Method 2
Sodium Adsorption Ration	Method 20b

Methods of the United States Salinity Laboratory as published in the Agricultural Handbook Number 60 entitled “Diagnosis and Improvement of Saline and Alkali Soils”.

2. The following nutrients and elements must be determined with an approved extraction method. Interpretation data must be given citing concentrations which are considered to be low, medium and high:

Boron, Calcium, Copper, Iron, Magnesium, Manganese, Molybdenum, Phosphorus, Potassium, Sodium, Sulfur, and Zinc

The approved methods are those cited by the Council on Soil Testing and Plant Analysis and those methods currently used by Soil Scientist and Agronomists and published in Communications in Soil Science and Plant Analysis, Soil Science and Soil Science Society of America Journal. Approved methods are Mehlich Number 3, Bray Pl, Bray P2, Olsen P, DTPA, Ammonium Acetate, Ammonium Bicarbonate-DTPA, and Hot Water Extract for Boron.

3. The saturation extract must be analyzed for Calcium, Magnesium, Sodium, Boron, Chloride, Nitrate and Sulfate.

4. The following trace metals must be measured by the DTPA extract:

Aluminum, Arsenic, Cadmium, Chromium, Cobalt, Lead, Lithium, Nickle, Selenium, Silver, Strontium, Tin and Vanadium.

5. The presence of Calcium Carbonate and/or Magnesium Carbonate must be determined.

6. Soil Texture and Organic Matter content may be estimated or determined by commonly used methods.

7. Interpretation of nutritional deficiencies or excesses and potential toxicities must be given.

8. Determine the following by methods approved by the American Society of Agronomy as published in the Methods of Soil Analysis, methods of the United States Salinity Laboratory as published in the Agricultural Handbook Number 60 entitled “Diagnosis and Improvement of Saline and Alkali Soils,” and bulk density of clods by the method published in Soil Science, Vol. 155, 325-330 (1993):

Exchangeable Ammoniumcation
Base Saturation

Cation Exchange Capacity
Carbonates Determination

Soil Bulk Density (Compaction) Sand,
Silt and Clay determination

Water Infiltration Rate – Method 34b of Agricultural Handbook Number 60

Elemental determinations to made according to methods approved by the EPA or by the American Society of Agronomy.

9. Growth Test for Toxic Constituents and/or Poor Physical Properties

Grow a dicot plant species and a monocot species with and without activated charcoal. Measure yield and percent of germination for all treatments. Report conclusions and findings.

F. Acceptable Elements:

1. The range of the essential elemental concentration in soil shall be as follows: Ammonium

Bicarbonate/DTPA Extraction, parts per million (mg/kilogram)

	Dry weight basis
Phosphorus	2 - 40
Potassium	40 - 220
Iron	2 - 35
Managanese	0.3 - 6
Zinc	0.6 - 8
Copper	0.1 - 5
Boron	0.2 - 1
Magnesium	50 - 150
Sodium	0 - 100
Sulfur	25 - 500
Molybdenum	0.1 - 30

If the soil pH is between 6 and 7, the maximum permissible elemental concentration shall be reduced 50%. If the soil pH is less than 6.0, the maximum permissible elemental concentration shall be reduced 75%. No more than three metals shall be present at 50% or more of the above values.

2. Germination and growth of plants shall not be restricted more than 10% compared to standard controls. Standard controls shall be both moncots and dicots. Total Petroleum Hydrocarbons shall not exceed 100 mg/kg dry soil measured per the modified EPA Method No. 8015. Total aromatic Volatile Organic Hydrocarbons (Benzene, Toluene, Xylene and Ethylbenzen) shall not exceed 2 mg/kg dry soil measure per EPA Methods No. 8020.

3. Electrical Conductivity, less than 3.0 millimhos/centimeter at 25 degree Celsius**.**

3.4 GRADING AND SITE PREPARATION:

A. Rough Grading:

1. Unless specified otherwise, remove existing soil, debris, weeds, roots and foreign material under the landscape area; perform clearing and grubbing in accordance with Subsection 3.4 of Section 02310 – EARTHWORK.

2. Scarify and compact the existing subgrade to a depth as specified in the Soil Investigation Report prior to backfilling with topsoil and soil conditioning. Remove during grading operation all stones over 1-inch in greatest dimension and excess soil.

3. Earthwork and Topsoil Placement: Shall include excavation and backfilling for the irrigation system and the preparation for the spreading, densification, cultivation and raking of topsoil, including fertilization and conditioning.

4. In Previously Paved Areas: After removing the pavement and base, remove the top 6-inches of existing soil and dispose of off the site. Replace with an approved Imported/Class A topsoil in accordance with Subsection 2.1(A)1 to the indicated finish grade.

B. Conservation of Topsoil:

For Unclassified/Class C topsoil acceptable by Architect as topsoil, maintain the topsoil stockpile in a manner in which will not obstruct the natural flow of drainage.

1. Maintain the stockpiled topsoil free from debris and trash, and contamination.

2. Keep the sampled or tested stockpiled top soil from other top soil. The Contractor shall re-test any mixed top soil at no additional cost to the City.

3. Keep the stockpiled topsoil damp to prevent dust and drying out.

C. Topsoil Preparation and Conditioning:

1. Type and Thickness: Place approved Imported/Class A topsoil over the entire rough graded site, in accordance with Subsection 2.1(A), to an approximate depth, as recommended by the Architect or as indicated on the Contract Drawings.

2. Do not work topsoil when it is so wet as to cause excessive compaction or forming of hard clods, or so dry as to cause dust.

3. Compact topsoil to 90% relative compaction prior to fertilizing conditioning. Add additional topsoil where required to achieve finish grades.

D. Fertilizing and Conditioning: Bring planting areas to finish grade including construction of landscape contour/ mounds before the spreading of specified fertilizer or soil conditioning materials and planting.

1. After approximate finished grades have been established, the upper 6-inches of top soil shall be conditioned and fertilized by means of mechanical tiller to the rate as specified on the drawings and the recommendations of the agricultural suitability and fertility analysis**]**.

The following organic, soil amendments and fertilizer rates, and quantities are to be used for bid basis only.

Nitrogen-Stabilized (Type 1 Organic Soil Amendment): 6 cu yds per 1000 sq ft
Commercial Fertilizer (Ammonium Phosphate 6/20/20): 15 lbs per 1000 sq ft
Agricultural Gypsum: 100 lbs. per 1000 sq. ft.

Soil Sulfur: 20 lbs. per 1000 sq. ft.

Final soils report shall provide amendment and fertilization recommendations for the specific plant materials list as shown on the contract drawings and reviewed the Architect. The Contractor shall comply with the reviewed recommendations without additional cost to the City.

2. The quantities of such materials required for planting areas shall be at the job- site. Furnish the City Inspector with delivery tickets before spreading to verify the source, kind and quantities delivered. Furnish City Engineer duplicate copies of the material invoices as required in Subsection 1.2 (G).

3. After spreading of fertilizer and/or soil conditioning materials, uniformly cultivate such materials into the upper 6-inches of top soil using suitable equipment operated in at least two directions approximately at the right angles. Make the resulting soil friable.

E. Finish Grading:

1. Contractor shall verify with all Contract Drawings all areas receiving mulching. Contractor shall verify the amount of fertilizer and soil conditioning, and specified thickness of mulching to determine the finish grade. Make finish grade smooth, uniform and free of abrupt grade changes and depressions to insure proper surface drainage.

2. Finish grade below adjacent paving, curbs or headers shall be 3-inches in shrub or ground cover areas and 1-inch in lawn areas.

3. Water soil after spreading of fertilizer and/or soil conditioning materials and allow it to settle to provide a stable surface. After the soil has dried out to a workable condition, re-grade, rake and smooth to the required grades and contours. Finished surfaces to be clean and suitable for planting.

4. Finish grading shall insure proper drainage of site. Surface drainage shall be away from all building foundations at a minimum of 2% or in accordance grades shown on Contract Drawings.

5. Eliminate all erosion scars.

6. Install area drain(s) in the planting areas at locations indicated on Contract drawings.

F. Excavation and Trenching: When site is completed with soil conditioning and finish grading operations, all completed new planting pits and trenches shall be backfilled and reconditioned to the specified topsoil thickness.

3.5 WEED ABATEMENT

A. Weed Abatement Procedures: All planting areas as designated on the plans to receive groundcover shall receive the following weed eradication procedures after the irrigation system has been installed and accepted and after all boxed trees have been installed and accepted, but prior to the installation of container trees, shrubs and groundcover. Weed Abatement: Round Up Pro or approved equal.

B. Clean up work: Manually remove all existing vegetation and dispose of it off-site in a suitable and lawful manner.

C. Fertilizer: Fertilize all planting areas with Gro-Power at the rate of 30 pounds per 1000 sq. ft. and begin watering process.

D. Watering Process: Water all planting areas thoroughly and continuously for a period of three (3) weeks. The Owner's Authorized Representative shall approve a specific watering duration and frequency program designed to germinate all residual weeds.

E. First Weed Spray: Discontinue watering process for two (2) days and then apply a contact weed killer at maximum label rate. The contractor shall apply the above agent to a planting area of approximately 1000 square feet and then evaluate effective coverage of weed species involved. The contractor shall make application adjustment such as the inclusion of additional spreading agent or spraying techniques in order to maximize the effective use of the contact weed killer as specified above. No irrigation water shall be applied for a minimum of four (4) days following application of the contact weed killer.

F. Watering Process: Water all planting areas thoroughly and continuously for a period of three (3) additional weeks. A shorter watering period may be permissible at the discretion of the Owner's Authorized Representative if he so determines that germination of the balance of weed seeds is sufficient for an effective kill.

G. Second Weed Spray: Discontinue watering process for two (2) days and then apply a contact weed killer at maximum label rates. The contractor shall apply the above agent to a planting area of approximately 1000 square feet and then evaluate effective coverage of weed species involved. The contractor shall make application adjustment such as the inclusion of additional spreading agent or spraying techniques in order to maximize the effective use of the contact weed killer as specified above. Allow a minimum of four (4) days without irrigation for effective, final weed kill.

H, Clean-up work: Manually clean and remove all weeds from the work area and continue planting process as noted and detailed

3.6 WEED/PEST CONTROL

A. Unless specified otherwise, weed abatement shall apply to all planting areas. The abatement operation shall commence before planting but only after removals, grading, hardscape construction, installation of irrigation system, soil preparation, and fine grading of planting areas have been completed.

B. All herbicides for weed control shall be applied with a photosensitive dye which will produce a contrasting color when sprayed upon the ground. The dye shall be applied in a manner so as not to leave any stain upon surfaces.

C. Pesticides, as required, shall be applied by a licensed pest control applicator in accordance with the requirements of the California Food and Agricultural Code and specified herein. Within 90days after the Notice-To-Proceed, a copy of the proposed application program shall be submitted to the City Engineer for review. The submittal shall include, but not be limited to the pesticides to be used, rates of application, methods of application, and areas to which pesticides are to be applied. Prior to commencement of application, the licensed pest control adviser must receive the City Engineer's approval of the program. The Contractor shall abide by all laws and codes governing weed abatement operations including but not limited to CAL-OSHA requirements.

D. Contractor shall notify the City Inspector a minimum of 72 hours prior to each application of pesticide/herbicide and shall indicate the hours during which the application will occur. No applications shall be made on Saturdays, Sundays, or legal holidays, unless otherwise prior approval by the Architect in writing.

E. Contractor responsibility during weed abatement operation and herbicide application shall include but not be limited to the following:

1. 72 hour written notice to the recreation director-in-charge, park and childcare patrons.

2. Submittal of a “Pest Control Recommendation Form” to the Architect.

3. A completed and accurate MSDS (Material Safety Data Sheet) shall be posted on the site of application, and the area of application shall be posted as such.

4. The application area shall be barricaded for public safety and appropriate signage, labels and warnings posted,

F. The following precautions shall be observed in handling and applying herbicides:

1. Before applying, the Contractor shall read and understand all instructions provided by the manufacturer.

2. Herbicidal product shall not be used when winds are gusty or in excess of 8 miles per hour, or when any other conditions exist which would result in drift.

3. Avoid combinations of pressure and nozzle type or adjustment that result in mist.

4. Do not apply during rain, or if rain is forecast within twelve hours. If rain occurs within a twelve-hour period, material must be reapplied after plant growth has dried out.

5. Contractor shall observe extreme care not to allow spray to contact desirable plant material. Use cardboard, plywood, or other appropriate material to shield plant materials outside of the treatment area from overspray.

6. Do not apply to bare ground.

G. New and/or existing plants which in the opinion of the Architect have been damaged by the application of pesticide/herbicide shall be replaced by the Contractor at their expense.

H. At the end of each work week, a written report of that week's applications of all pesticides/herbicides shall be submitted to the Architect.

I. Weed Suppression (Non-Herbicide Weed Removal) shall apply to all turf and planting areas. The suppression operation shall be commenced only after removals, grading, hardscape construction, installation of irrigation system, soil preparation, and fine grading of turf and planting areas have been completed. The contractor shall thoroughly water all turf and planting areas for a minimum period of two weeks prior to commencing removal. Contractor shall clear the site of all dead vegetation and living weeds by hand or mechanical means. All removed vegetation shall be properly disposed of off-site.

3.7 PLANTING

A. General: All plant materials, including plants previously approved at the nursery, shall be inspected prior to planting. The Contractor shall be responsible for the condition of all plants, planted or otherwise, until final acceptance by the City and termination of maintenance period. Contractor shall be obligated to honor all requirements of warranty as indicated herein.

1. Perform planting with materials and equipment according to procedures favorable to the optimum growth of the plant. Do not plant during windy conditions.

2. Except as noted for specimen planting, start all planting operations immediately following the completion and approval of the irrigation system.

B. Protection and Storage:

1. Keep all plant materials delivered to the job-site in a healthy condition for planting.

2. Do not allow plants to dry out.

3. Separate bare root stock and “heal in” in moist earth or other suitable material.

C. Layout and Plant Locations:

1. Plant locations indicated on the Contract Drawings are approximate.

2. Plants may be re-spotted prior to planting as directed by the Architect, without additional compensation to the Contractor.

3. Make a detailed layout of plants, etc., in the planting areas and obtain approval of the Architect prior to actual planting operations.

4. Locate the first row of plants in areas designated for on center spacing at one- half the designated spacing from the edge of the area.

5. Do not stretch the maximum specified spacing for each species shown on the plans.

6. Unless otherwise specified, all planting areas except lawn shall receive a minimum three (3) inch deep layer of tree chip mulch (Type 5 Organic soil amendment). Mulch shall be spread evenly throughout planting beds and tree watering basins. Do not bury ground cover.

D. Container Plants Backfill Mix:

1. Unless specified otherwise or required by the agricultural suitability and fertility analysis, container plants shall be backfilled with:

a. 6 parts by volume on-site soil**.**

b. 4 parts by volume Type 1 Organic Soil Amendment.

c. Slow release commercial fertilizer at the rate of 1 lb per gallon of container size or 1 lb. per 4” of box size.

d. Broadleaf P-4 water holding polymer at the rate of 1 oz. per foot of rootball diameter.

e. 8-8-4 Commercial 20-10-5, 21 gram fertilizer planting tablets with the following application rates:

Container Size

1 gallon = 1 tablet

5 gallon = 2 tablets

15 gallon = 6 tablets

Larger than 15 gallon size – 2 tablets per half inch of trunk diameter.

2. All plants which settle deeper than specified above shall be raised to the correct level. After the plant has been placed, additional backfill shall be added to the hole to cover approximately one-half the height of the rootball. At this stage, water shall be added to the top of the partly filled hole to thoroughly saturate the rootball and adjacent soil.

3. The remainder of the hole shall be backfilled.

4. If planting tablets are used, they shall be set with each plant on the top of the rootball while plants are still in their containers so the required number of tablets to be used in each hole can be verified. After verification insert tablets 3-inhes below the surface into the backfill mix spaced evenly around the plant.

5. Backfill for Palm tree shall be 100 percent clean concrete sand. Do not use organic amendment.

E. Specimen Planting: When in close proximity to irrigation lines, plants in boxes (24-inches or larger) shall be planted before installation of lateral irrigation lines. Re-route irrigation lines in conflict with specimen plant locations to clear the root ball.

F. Tree and Shrub Planting:

1. Make planting holes approximately square with vertical sides the depth of the plant container and twice the width of the plant container or root ball and larger if necessary to permit handling and planting without injury to the root system.

   Install the root barrier where indicated on the Contract Drawings in accordance with the details and/or the manufacturer’s recommendations.

2. Do not plant plants with a broken or cracked root ball.

3. Open and remove plant containers in such a manner that the plant root is not injured.

4. Scarify native soil at the bottom of planting holes.

5. After "water settling" the bottom half of the planting hole, set the plant approximately in the center of the planting hole and adjust the root crown flush to finish grade.

6. Backfill balance of the planting hole with the specific backfill mix and fertilizer and "water settle".

7. Prune or remove any broken or damaged minor limbs. Any major damage to plant material shall be brought to the attention the Architect or authorized representative for evaluation.

8. Form a circular watering basin slightly larger than the planting hole; 6-inches high for trees and 3-inches high for shrubs. Make the bottom of the basin at surrounding finish grade. Water basin berms located in lawn areas shall be removed at the end of the maintenance period.

9. Restore the area around the plants to finish grade and dispose of excess soil.

10. After planting, plants shall be plumb with the root crown at its natural depth with respect to finish grade.

G. Ground Cover and Vine Planting:

1. Complete site preparation, fertilization and conditioning and fine grading; apply weed and pest control and moisten the planting area prior to planting.

2. Plant in moist soil, spaced as indicated on the Contract Drawings.

3. Plant each plant with its proportionate amount of flat soil to minimize root disturbance.

4. The degree of soil moisture in the flat shall be such that the soil does not crumble when removing plant.

5. Following planting of ground cover or shrubs, spread over entire site with 3-inch thick Type 5 Organic Soil Amendment.

6. Restore finish grade to insure proper surface drainage.

7. Plant vines as shown on Contract Drawing. Temporary staking shall be removed at the start of the plant establishment period unless otherwise directed.

8. Affix all branches to walls or fences with 1-inch-wide green plastic nursery tapes or to wall or fence with vine tie and wall tack as per notes and details on Contract Drawings.

3.7 PLANT STAKING AND GUYING

A. Tree Staking: Stake trees with galvanized steel pipe or wood lodgepole materials as indicated on the Drawings.

1. Install stakes vertically on the windward side of the tree. Position the stake at least 6-inch from the trunk at ground level and 30-inches into the soil in a manner to avoid injury to the roots or breaking the root ball.

2. Secure plant trunk to the stake with two ties; one just below the head of the tree and one half way between finish grade and the top tie.

3. Attach tie to wooden stake with one furring nail at the tie locations described above. Attach tie to metal stakes through ¼-inch hole drilled at tie locations.

4. Secure wire ties by twisting the ends.

3.8 MAINTENANCE AND PLANT ESTABLISHMENT

A. General Maintenance: Maintain all areas on a continuous basis as they are completed during the progress of the work and during the establishment period. Continue to maintain the area of work until final acceptance of the Contract by the City. Maintenance shall include continuous operations of picking up trash and emptying trash cans daily, watering, weeding (including all broad leaf weeds in lawn areas), trimming, mowing, rolling, edging, cultivation, fertilization, spraying, control of pests, insects and rodents, reseeding, plant replacement (irrespective of cause) or any other operations necessary to assure normal plant growth. Any malfunctions of, or damage to the irrigation system caused by the Contractor in the execution of his work shall be repaired within 24 hours. The Contractor is responsible for keeping all plant material sufficiently watered during any irrigation failures.

B. Plant Establishment:

1. Request a final inspection to begin the plant establishment and maintenance period after all planting and related work have been completed in accordance with the Contract Documents.

2. After planting is completed and approved, a field notification will be issued to the Contractor to establish the effective beginning date of the plant establishment period.

3. The City may extend the plant establishment period if the planted areas are improperly maintained, or if appreciable plant replacement is required, or other corrective work becomes necessary. The plant establishment period for all plants shall be for the duration of 90 calendar days**.**

4. Plant Establishment is considered as part of the contract works and paid for in accordance with Section 37 - PAYMENTS of the General Conditions. The Plant Establishment consists of:

   a. Maintenance of planting, including watering, plant replacement, weed and pest control, pruning/edging, fertilization and any other conservation tasks to assure the standard rate of healthy growth and project aesthetics.

   b. Maintenance of irrigation systems.

   c. Daily Site clean-up which includes, but is not limited to trash pick-up, clearing of catch basins, and sweeping of walks.

   d. Maintain safe conditions.

   e. Perform other work as determined necessary by the City as specified in these Specifications.

   f. Keep all seeded and planted areas moist during the establishment period. If irrigation system is not available provide whatever watering systems is necessary to provide adequate watering during the establishment period without causing erosion detrimental to the planting area. Water all plants immediately after planting.

5. Contractor shall submit the form entitled MONTHLY MAINTENANCE SCHEDULE. They shall provide unit cost for all tasks proposed. Form shall be standard type used in the industry and completed to meet the intent of the plant establishment. This form establishes a reasonable minimum of services for plant establishment and it shall remain the responsibility of the Contractor to provide the necessary services beyond that minimum for situations due to his performance or lack thereof, to establish the plant materials in situations prior to acceptance of the Contract by the City.

6. If approved by the Architect, the Contractor, at their expense, may use plants of a larger container size than those originally specified for replacement plants during the first sixty (60) working days of the plant establishment period. All replacement plants are subject to the same inspection requirements set forth in these specifications for original plant installation.

7. After 90 calendar days of the plant establishment period have been completed, replacement of plants, except for ground cover plants shall be:

1-gallon	for seeded, pot, and liner-size plants
5-gallon	for 1-gallon size plants
15-gallon	for 5-gallon size plants
24-inch box	for 15-gallon size plants

8 Not more than twenty (20) working days prior to completion of the plant establishment period, the Contractor shall apply one application of herbicide conforming to the provisions under “Weed/Pest Control” of this Section or elsewhere in the Project Manual.

9. During the plant establishment period, damage caused by erosion shall be repaired.

10. Reconditioning*:* At thirty (30) day intervals after planting, apply type and rates of commercial fertilizer as per recommendations of the Agricultural Sustainability and Fertility Analysis. Thoroughly water the area after applying fertilizer. All fertilizer applications shall be done under the inspection of the City Inspector or authorized representative. Reconditioning shall be applied to trees, shrubs, vines, and ground cover areas as specified within the Project Manual. The Contractor shall notify the City Inspector at least five (5) days prior to applying each application of commercial fertilizer. At five (5) weeks after lawn seeding the Contractor shall apply a slow release 38-0-0 granular fertilizer at a rate of 15 pounds per 1000 sq. ft. to all lawn areas.

11. Basins and basin walls shall be kept well-formed and free of weeds.

12. Keep all planted areas free of weeds. Cultivate weekly at intervals not to exceed 10 days.

13. Trees and shrubs shall be healthy and vigorous at the completion of the maintenance period. Broken or vandalized tree stakes shall be repaired to a condition as initially installed within seven (7) days.

14. Plants shall be kept watered and unsuitable plants shall be replaced.

15. During the plant establishment period, the automatic irrigation system shall be operated in the automatic mode, unless otherwise permitted by the City. When any automatic irrigation component is operated manually on a working day, that day will not be credited as a plant establishment working day unless the manual operation has been permitted in writing by the City Inspector.

16. Upon completion of the plant establishment, Contractor shall submit the Final Watering schedule encased in hermetically sealed plastic. It shall be permanently attached by a short chain to the inside of the controller.

17. A Contractors representative who is competent in operating the irrigation controller(s) shall be present at the job-site when watering is in progress.

18. As part of the plant establishment period, thirty (30) days prior to a completion of the plant establishment period, written instruction shall be submitted to the City Inspecctor by a qualified person from the Contractor's personnel on the use and adjustment of the irrigation controller installed.

19. The approved written instructions by the Architect on the use and adjustment of the installed automatic controllers shall be performed and the approved watering schedule program shall be implemented within the last ten (10) working days of the plant establishment period. Such programming shall not relieve the Contractor of his responsibility to apply sufficient water as conditions may require to keep the soil and plant roots moist.

20. Weeds in all areas of the plants shall be controlled as specified herein or as directed by the City Inspector.

21. Surplus earth, papers, trash, and debris, within planting areas shall be removed and disposed of off-site. Such disposal shall conform to governmental regulations of all agencies having jurisdiction at the disposal site.

22. During the plant establishment period, any plant material shall be pruned by the Contractor at his expense, when directed to do so by the City Inspector.

C. Pruning: The Architect will designate any required pruning of plants at the start of the plant establishment period. Perform the pruning as part of the plant establishment work.

D. Damage:

1. Replace as soon as possible plants that show signs of failure to grow at any time during the Contract period or those plants so injured or damaged so as to render them unsuitable for the purpose intended, at no additional cost to the City.

   Provide replacement plants of the same type and size to match adjacent plants. New plants shall be inspected at the source, prior to the delivery. Furnish plant and fertilizer as specified. New plantings shall be subject to a new 90 days establishment period and guarantee specified herein.

2. Damage to planting areas shall be repaired immediately.

   Depressions caused by vehicles or foot traffic shall be filled with topsoil and leveled.

E. Final Inspection/Final Acceptance:

1. Upon completion of the plant establishment period, a final inspection for acceptance will be performed by the City Inspector and Architect or authorized representative. The Contractor shall request for inspection at least three (3) working days prior to the anticipated date. For this inspection, the site must be thoroughly cleared of all debris and excess material removed. If work fails to pass final inspection, any subsequent inspection must be rescheduled as per above, and will be charged to the Contractor.

2. If the plant establishment period is satisfactorily completed ahead of other work included in the Contract, the plants establishment shall be extended and shall be the responsibility of the Contractor until all other work has been completed and accepted by the City.

3.9 GUARANTEE

A. General: Guarantee the performance of maintenance and the life of all trees for a period of one year from the date of acceptance of the contract. Guarantee all shrubs for a period of six (6) months from the date of acceptance of the Contract.

B. Deficiencies: Should any deficiencies develop within the specified guarantee period, correct such deficiencies to the full satisfaction of the City Inspector without added expense to the City. All replacement plants shall be subject to a new guarantee for a period as described herein above.

3.10 FINAL CLEAN-UP

A. Required: Comply with provisions of Section 01740 – REMOVAL, CLEANUP AND DEMOBILIZATION of the GENERAL REQUIREMENTS. Upon completion of all landscape work and before final acceptance, remove all tools, surplus materials, apparatus, debris, weeds and exterminate rodents from the job-site. Leave the job- site in a neat, clean condition, acceptable to the City Inspector. Wash, clean and leave all paved areas without stains.

END OF SECTION

SECTION 33 10 00

WATER UTILITIES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water mains, valves, fittings, and accessories.

B. Fire hydrants and assemblies.

C. Backflow preventer.

D. Thrust blocks.

1.2 REFERENCES

A. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers.

B. ASSE 1015 - Performance Requirements for Double Check Backflow Prevention Assembly.

C. AWWA C104 - Standard for Cement-Mortar Lining for Ductile- Iron and Gray Iron Pipe and Fittings for Water.

D. AWWA C105 - Standard for Polyethylene Encasement for Ductile-Iron Piping for Water and other Liquids.

E. AWWA C110 - Standard for Gray-Iron and Ductile-Iron Fittings, 3 inch through 48 inch for Water and Other Liquids.

F. AWWA C111 - Standard for Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

G. AWWA C151 - Standard for Ductile-Iron Pipe Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.

H. AWWA C300 - Standard for Reinforced Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids.

I. AWWA C502 - Standard for Dry-Barrel Fire Hydrants.

J. AWWA C600 - Standard for Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances.

K. AWWA C651 - Standard for Disinfecting Water Mains.

L. AWWA C900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch for Water.

M. AWWA C901 - Standard for Polyethylene Pressure. Pipe and Tubing 1/2 inch through 3 inch, for Water Service.

N. AWWA M17 - Manual for Installation, Field Testing, and Maintenance of Fire Hydrants.

O. AWWA M23 - Manual for PVC Pipe-Design and Installation.

P. ASTM B88 - Seamless Copper Water Tube.

Q. ACPA - American Concrete Pipe Association, Concrete Pipe Handbook.

R. CDA - Copper Development Association, Copper Tube Handbook.

S. NFPA 1963 - Standard for Screw Threads and Gaskets for Fire Hose Connections.

T. UL 246 - Standard for Hydrants for Fire Protection Service.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the Work of this Section.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Submit product data for pipe and pipe accessories.

C. Submit reports on piping disinfecting.

1.5 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Section 01 77 00.

B. Accurately record location of pipe runs, connections, and depths.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

2. PART 2 PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in potable water systems. Where more than one type of materials or product are indicated, selection is Installer's option.

B. Piping: Provide pipes of the following materials, of weight/ class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes , with joining method as indicated.

C. Copper Tube: ASTM B88; Type K hard drawn.

D. Ductile-Iron Pipe: AWWA C151, with cement mortar lining complying with AWWA C104; Class 51 unless otherwise indicated.

1. Fittings: Ductile-iron, AWWA C110; cement lined, AWWA C104; and rubber-gasket joints, AWWA C111.

2. Encasement: AWWA C105, polyethylene film tube.

E. Concrete Pipe: Reinforced steel cylinder type, AWWA C300.

1. Fittings: Reinforced concrete pipe fittings.

F. Polyvinyl Chloride (PVC) Pipe: AWWA C900, Class 200.

1. Fittings: Integral wall (thickened bell end), integral sleeve reinforced bell end or elastomeric gasket couplings meeting the requirements of AWWA C900.

2.2 HYDRANT

A. Type as indicated on plans.

B. Cast-iron body, compression - type valve, opening against pressure and closing with pressure, 150 psig working pressure.

C. Hydrant Extensions: Fabricate in multiples of 6 inches with rod and coupling to increase barrel length.

D. Outlet Threads: As indicated on plans.

E. Finish: Primer and two coats of enamel in color required by fire department.

2.3 BACKFLOW PREVENTORS

A. ASSE standard backflow preventer of size indicated for maximum flow rate and maximum pressure loss indicated.

B. ASSE 1015 double-check backflow prevention assembly with valves on inlet and outlet and strainer on inlet. Include test rocks with 2 positive-seating check valves for continuous-pressure application.

2.4 PIPE IDENTIFICATION

A. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - WATER LINE BURIED BELOW."

B. Metallic-Lined Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - WATER LINE BURIED BELOW."

C. Nonmetallic Piping Label: Engraved plastic-laminate label, for installation on main electrical meter panel; not less than 1 inch by 3 inches, with captions "CAUTION - THIS STRUCTURE HAS A NONMETALLIC WATER SERVICE."

2.5 PIPE ACCESSORIES

A. Valves and Fittings: Conform to AWWA Specifications. All valves and fittings shall be designed for an operating pressure larger than the design pressure of lines on which they are installed.

B. Gate Valves: Double disk parallel seat type, iron body, bronze mounted inside screw, non-rising stem, flanged or screw filling standard hub nut.

C. Thrust Blocking: Provide on water lines at bends, tees and fire hydrants. Use 2,500 psi concrete as specified in Section 03 30 00. Locate and place in accordance with standard practice.

D. Access Boxes: Unless otherwise specified in accordance with Section 22 30 00.

2.6 FILL MATERIAL

A. Sand: Type specified in Section 31 20 00.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that trench cut is ready to receive work, and excavations, dimensions, and elevations are as indicated.

B. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fill material of sand.

B. Remove large stones or other hard matter which could damage drainage tile or impede consistent backfilling or compaction.

3.3 INSTALLATION - PIPE AND FITTINGS

A. Maintain separation of water main from sewer piping in accordance with code.

B. Install pipe to indicated elevation to within 5/8 inches.

C. Route pipe in straight line.

D. Install pipe to allow for expansion and contraction without stressing pipe of joints.

E. Slope water pipe and position drains at low points.

F. Form and place concrete for thrust restraints at each elbow or change of direction of pipe.

G. Copper Tube: Install in accordance with CDA "Copper Tube Handbook"

H. Ductile-Iron Pipe: Install in accordance with AWWA C600 “Appurtenances." Install polyethylene encasement in accordance with AWWA C105.

I. Concrete Pipe: Install in accordance with ACPA "Concrete Pipe Handbook."

J. Polyvinyl Chloride (PVC) Pipe: Install in accordance with AWWA M23.

K. Form and place concrete for thrust blocks.

L. Install warning tape during back-filling of trench for underground water service piping. Locate 8 inches below finished grade directly over piping. Attach non-metallic piping label permanently to main electrical meter panel.

M. Water Main Connection: Arrange and pay for tap in water main, of size and in location as indicated, from water Purveyor.

N. Water Service Termination: Terminate water service piping 5'-0" from building foundation in location and invert as indicated. Provide temporary pipe plug for piping extension into building.

3.4 INSTALLATION - HYDRANT

A. Comply with AWWA M17. Install with gate valve and provision for drainage as indicated.

B. Set hydrants plumb and locate nozzles perpendicular to roadway.

C. Set hydrants to grade with nozzles at least 20 inches above ground.

D. Locate control valve 4 inches away from hydrant.

E. Provide drainage pit 36 inches square by 24 inches deep filled with 2 inch washed gravel. Encase elbow of hydrant in gravel to 6 inches above drain opening. Do not connect drain opening to sewer.

F. Paint hydrants in accordance with Section 09 90 00.

3.5 INSTALLATION - BACKFLOW PREVENTOR

A. Install backflow preventer of type, size and capacity indicated. Include valves and test cocks.

B. Install according to authority having jurisdiction.

C. Support backflow preventers, valves, and piping on 2,500-psi; concrete piers as indicated.

3.6 INSTALLATION OF VALVES

A. General: Install valves as indicated with stems pointing up. Provide valve box over underground valves.

3.7 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered, and after thrust blocks have sufficiently hardened. Fill pipeline 24 hours prior to testing, and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Test: Test at not less than 1-1/2 times working pressure for two hours.

3.8 ADJUSTING AND CLEANING

A. Use disinfecting procedure prescribed by authority having jurisdiction.

B. In case a method is not prescribed by that authority, use procedure described in AWWA C651, or as described below:

1. Fill system or part thereof with water/chlorine solution containing at least 50 ppm of chlorine. Valve off system or part thereof and allow to stand for 24 hours.

2. Drain system or part thereof of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine. Valve off system or part thereof and allow to stand for three hours.

3. Flush system with clean potable water until chlorine does not remain in water coming from system.

C. Prepare reports for all disinfecting activities and submit to Architect.

END OF SECTION

SECTION 33 30 00

SANITARY UTILITIES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sanitary drainage piping, fittings, and accessories.

B. Connection of building sanitary drainage system to municipal sewers.

C. Manhole access, cleanout access.

1.2 REFERENCES

A. ACPA - American Concrete Pipe Association.

B. ASTM A74 - Cast Iron Soil Pipe and Fittings.

C. ASTM C12 - Practice for Installing Vitrified Clay Pipe Lines.

D. ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

E. ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.

F. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gasketts.

G. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

H. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated.

I. ASTM D2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.

J. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.

K. ASTM D2855 - Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

L. ASTM D3212 - Specifications for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

M. ASTM D3034 - Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

N. AWWA C105 - Standard for Polyethylene Encasement for Ductile-Iron Piping for Water and other Liquids.

O. CISPI - Cast Iron Soil Pipe Institute.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the Work of this Section.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Submit product data for pipe and pipe accessories.

1.5 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Section 01 77 00.

B. Accurately record location of pipe runs, connections, manholes, cleanouts and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

2. PART 2 PRODUCTS

2.1 SEWER PIPE MATERIALS

A. Vitrified Clay Pipe: ASTM C700; extra standard strength, unperforated; plain end joints.

B. Vitrified Clay Pipe Joint Device: ASTM C425, compression gasket joint.

C. Plastic Pipe: ASTM D2751, SDR 35, acrylonitrile-butadiene-styrene (ABS) material; bell and spigot style solvent sealed end joints.

D. Plastic Pipe: ASTM D3034, Type PSM, SDR35 wall thickness, polyvinyl chloride (PVC) material; bell and spigot style solvent sealed end joints.

2.2 PIPE ACCESSORIES

A. Fittings: Same material as pipe, molded or formed to suit pipe size and end design, in required 'T', bends, elbows, cleanouts, reducers, traps, and other configurations required.

2.3 MANHOLES AND CLEANOUTS

A. Lid and Frame: Cast iron construction, removable lid, closed lid design; nominal lid and frame diameter as indicated.

B. Shaft Construction and Concentric Eccentric Cone Top Section: Reinforced precast concrete pipe sections, lipped male/female dry joints; cast steel ladder rungs into shaft sections at 12 inches nominal shaft diameter as indicated.

C. Base Pad: Cast-in-place concrete of type specified in Section 03 30 00; levelled top surface to receive concrete shaft sections, sleeved to receive sewer pipe sections.

D. Cleanouts: Cast-iron ferrule and countersunk brass cleanout plug, with round cast-iron access frame and heavy-duty secured, scoriated cast-iron cover.

2.4 FILL MATERIAL

A. Sand: Type specified in Section 31 20 00.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that trench cut is ready to receive work, and excavations, dimensions, and elevations are as indicated.

B. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fill material of sand.

B. Remove large stones or other hard matter which could damage drainage tile or impede consistent backfilling or compaction.

3.3 INSTALLATION - PIPE

A. Extend sanitary sewerage system to connect to building sanitary drain, of sizes and in locations indicated.

B. Join and install cast-iron soil pipe and fittings with compression gaskets in accordance with CISPI Handbook, Volume I. Use service class gaskets.

C. Join vitrified clay pipe and fittings with rubber sealing elements and install piping in accordance with ASTM C12.

D. Solvent cement PVC pipe and fittings in accordance with ASTM D2855 and install piping in accordance with ASTM D2321.

E. Place pipe on minimum four inch deep bed of sand.

F. Lay pipe to slope gradient noted on Drawings with maximum variation from true slope of 1/8 inch in 10 feet.

G. Install warning tape during back-filling of trench for underground sanitary sewer piping. Locate 8 inches below finished grade directly over piping.

H. Install sand at sides and over top of pipe. Provide top cover to minimum compacted thickness of 12 inches.

I. Place sand in maximum 6 inch lifts, consolidating each lift.

J. Increase compaction of each successive lift. Refer to Section 31 20 00 for compaction requirements. Do not displace or damage pipe when compacting.

K. Connect to municipal sewer system as indicated on plans.

3.4 INSTALLATION - CLEANOUTS

A. Install cleanouts and extension from sewer pipe to cleanout at grade as indicated.

B. Set cleanout frame and cover in concrete block 18 x 18 x 12 inches deep.

C. Set top of cleanouts flush with paved surfaces. Elsewhere, set top 1 inch above surrounding earth grade.

D. Install accessories as indicated.

E. Set top of frame and covers flush with paved surfaces. Elsewhere, set top 3 inches above grade.

3.5 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01 45 29.

3.6 PROTECTION

A. Protect finished installation under provisions of Section 01 61 00.

B. Protect pipe from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 40 00

STORM DRAINAGE UTILITIES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Storm drainage piping, fittings, and accessories.

B. Connection of building and site storm drainage system to point of disposal.

C. Catch basins, cleanouts, outfalls, and manhole access.

D. Paved area drainage, and site surface drainage.

1.2 REFERENCES

A. ACPA - American Concrete Pipe Association.

B. ASTM A74 - Cast Iron Soil Pipe and Fittings.

C. ASTM C12 - Practice for Installing Vitrified Clay Pipe Lines.

D. ASTM C33 - Specification for Cement Aggregates.

E. ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

F. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated.

G. ASTM C858 - Specifications for Underground Precast Concrete Utility Structures.

H. ASTM D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

I. ASTM D2855 - Practice for making Solvent - Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

J. ASTM D2321 - Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications.

K. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

L. ASTM D3350 - Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.

M. AWWA C105 - Standard for Polyethylene Encasement for Ductile-Iron Piping for Water and other Liquids.

N. CISPI - Cast Iron Soil Pipe Institute.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the Work of this Section.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Submit product data indicating pipe, pipe accessories and drainage structure.

C. Submit manufacturer's installation instructions.

1.5 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Section 01 77 00.

B. Accurately record location of pipe runs, connections, catch basins, manholes, cleanouts, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

2. PART 2 PRODUCTS

2.1 STORM DRAINAGE PIPE MATERIALS

A. Polyvinyl Chloride Pipe (PVC): ASTM D3034; SDR 35 minimum wall thickness; bell and spigot style; solvent cement joints conforming to ASTM D2564.

B. Perforated Polyvinyl Chloride Pipe (PVC): ASTM D3034; SDR 35 minimum wall thickness; bell and spigot style; solvent cement joints conforming to ASTM D2564; perforations to be symmetrically located in an arc of 160 degrees. Perforations shall have a total open area of at least 0.3 square inches per lineal foot of pipe. Perforations shall be either holes or slots. Diameter of holes may vary from 1/4 inch minimum to 3/8 inch maximum; the width of the slots may vary from 3/16 inch minimum to 5/16 inch maximum; the length of the slot shall not exceed 4 inches.

C. Substitutions: Under provisions of Section 01 25 13.

2.2 PIPE ACCESSORIES

A. Fittings: Same material as pipe, molded or formed to suit pipe size and end design, in required 'T', bends, elbows, cleanouts, reducers, traps, and other configurations required.

B. Geotextile Fabric: As specified in Section 31 20 00.

2.3 PIPE IDENTIFICATION

A. Metallic-Lined Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - STORM SEWER SERVICE BURIED BELOW."

2.4 CATCH BASINS

A. Basin Lid and Frame: Galvanized cast iron construction, hinged lid, linear grill lid design; nominal lid and frame size as indicated. Grate bars to be less than 1/2 inch apart.

B. Base Pad: Cast-in-place concrete of type specified in Section 32 13 13; levelled top surface sleeved to receive storm sewer pipe sections.

2.5 MANHOLES AND CLEANOUTS

A. Lid and Frame: Cast iron construction, removable lid, closed; nominal lid and frame diameter as indicated.

B. Cleanouts: Cast-iron ferrule and countersunk brass cleanout plug, with round cast-iron access frame and heavy-duty, secured, scoriated cast-iron cover.

2.6 CURB INLETS

A. Cast-in-place reinforced concrete of type specified in Section 03 30 00. Conform to standards of authority having jurisdiction and as indicated.

B. All exposed face plates and metal parts to be galvanized.

2.7 OUTFALLS

A. Cast-in-place reinforced concrete of type specified in Section 03 30 00.

B. Provide head wall, apron, tapered sides and rip-rap as indicated.

C. Rip rap to be irregular broken stone weighing between 10 to 40 pounds each.

2.8 FILL MATERIAL

A. Sand: Type specified in Section 31 20 00.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that trench cut is ready to receive work, and excavations, dimensions, and elevations are as indicated.

B. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fill material of sand.

B. Remove large stones or other hard matter which could damage drainage tile or impede consistent backfilling or compaction.

3.3 INSTALLATION - PIPE

A. Extend storm sewerage piping to connect to building storm drain, of sizes and in locations indicated.

B. Include storm sewerage system piping and appurtenances from a point 5'-0" outside building foundation to point of disposal.

C. Solvent cement PVC pipe and fittings in accordance with ASTM D2855 and install piping in accordance with ASTM D2321.

D. Place pipe on minimum 4 inch deep bed of sand.

E. Install perforated PVC pipe at a minimum slope as indicated on plans. Coordinate with installation of drainage fill and filter fabric specified in Section 31 20 00.

F. Install warning tape during back-filling of trench for underground storm drain piping. Locate 8 inches below finished grade directly over piping.

G. Lay pipe to slope gradients noted with maximum variation from true slope of 1/8 inch in 10 feet.

H. Install coarse sand at sides and over top of pipe. Provide top cover to minimum compacted thickness of 12 inches.

I. Place sand in maximum 6 inch lifts, consolidating each lift.

J. Increase compaction of each successive lift. Refer to Section 31 20 00 for compaction requirements. Do not displace or damage pipe when compacting.

K. Connect to municipal drainage system as indicated on plans.

3.4 INSTALLATION - CATCH BASINS, AND MANHOLES

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for storm drainage pipe end sections.

C. Establish elevations and pipe inverts for inlets and outlets as indicated.

D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

E. Install accessories as indicated.

F. Set top of frame and covers flush with paved surfaces. Elsewhere, set tops 3 inches above grade.

3.5 INSTALLATION - CLEANOUTS

A. Install cleanouts and extension from sewer pipe to cleanout at grade as indicated.

B. Set cleanout frame and cover in concrete block as indicated on plans.

C. Set top of cleanout flush with paved surfaces. Elsewhere, set top 1 inch above surrounding earth grade.

3.6 INSTALLATION - INLETS AND OUTFALLS

A. Construct as indicated of reinforced concrete to elevations required.

B. Surfaces shall be formed by forms and shall not be shaped by plastering.

C. Install steps, grating and face plate assemblies as indicated.

D. Extend rip-rap beyond outfall as indicated.

3.7 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01 45 29.

B. Clear interior of piping and structures of dirt and other debris as work progresses.

3.8 PIPELINE FLUSHING

A. Flush newly constructed storm drain piping with water.

B. Collect and remove any rock, debris and silt using a metal screen during flushing procedure.

3.9 PROTECTION

A. Protect finished installation under provisions of Section 01 61 00.

B. Protect pipe from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 51 00

NATURAL GAS DISTRIBUTION

1. PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe and fittings.

B. Valves.

C. Service regulators.

D. Underground pipe markers.

1.2 REFERENCES

A. ASCE 25 - Earthquake Actuated Automatic Gas Shut Off Valves.

B. ASME B16.3 - Malleable Iron Threaded Fittings.

C. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

D. ASTM A234 - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

E. ASTM D2513 - Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.

F. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.

G. AWS D1.1 - American Welding Society - Structural Welding Code.

1.3 SUBMITTALS

A. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories under provisions of Section 01 33 00.

1.4 CLOSEOUT SUBMITTALS

A. Submit documents under provisions of Section 01 77 00.

B. Project Record Documents: Record actual locations of pipe mains, valves, connections, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with utility company standard.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Requirements for transporting, handling, storing, and protecting products as required by Section 01 73 00.

B. Deliver and shore valves in shipping containers with labeling in place.

2. PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. Per the Gas Company requirements and specifications. If not indicated otherwise, as follows:

B. Steel Pipe Above Ground: ASTM A53, Schedule 40 black:

1. Fittings: ASTM A234, forged steel welding type.

2. Joints: Threaded. Welded for pipe sizes over 2 inches.

C. Polyethylene Pipe Below Grade: ASTM D2513, SDR 11.

1. Fittings: ASTM D2513 or ASTM D2683.

2. Joints: Fusion Welded.

2.2 VALVES

A. Per the Gas Company requirements and specifications. If not indicated otherwise, as follows:

B. 2 inches and Smaller: 150 psig WOG, bronze body, bronze tapered plug, lubricated, Teflon packing, threaded ends with cast iron curb box, cover, and key.

C. 2-1/2 inches and Larger: 125 psig WOG, steel body and tapered plug, lubricated. Teflon packing, threaded ends, with cast iron curb box, cover, and key.

D. Earthquake Valve: ASCE 25, mechanical-operation and automatic-shutoff type with operating pressure rating at least as great as system pressure.

E. Furnish valves with manufacturer's name and pressure rating marked on valve body.

2.3 SERVICE REGULATOR

A. Per the Gas Company requirements and specifications. If not indicated otherwise, as follows:

B. Single stage, malleable iron body, corrosion-resistant, pressure regulator with atmospheric vent, elevation compensator; threaded ends for 2 inch and smaller, flanged ends for 2-1/2 inch and larger.

C. Furnish valves with manufacturer’s name and pressure rating marked on valve body.

D. Capacity: Inlet and outlet gas pressures, specific gravity, and flow rate as indicated on Drawings.

2.4 UNDERGROUND PIPE MARKERS

A. Per the Gas Company requirements and specifications. If not indicated otherwise, as follows:

B. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Natural Gas Service" in large letters.

2.5 BEDDING AND COVER MATERIALS

A. Per the Gas Company requirements and specifications. If not indicated otherwise, as follows:

B. Bedding: Sand as specified in Section 31 20 00.

C. Cover: Sand, as specified in Section 31 20 00.

D. Soil Backfill from Above Pipe to Finish Grade: Soil type, as specified in Section 31 20 00.

3. PART 3 EXECUTION

3.1 EXAMINATION

A. Verify building service connection and utility gas main size, location and invert area as indicated on Drawings.

3.2 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs. Bevel plain end ferrous pipe 2-1/2 inches diameter and larger. Thread ferrous pipe 2 inches diameter and smaller.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections with flanges or threading and unions.

3.3 BEDDING

A. Per the Gas Company requirements and specifications. If not indicated otherwise, as follows:

B. Excavate pipe trench in accordance with Section 31 20 00.

C. Place bedding material at trench bottom, level fill materials in one continuous layer.

D. Backfill around sides and to top of pipe with cover fill, tamped in place and compacted.

E. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPING

A. Per the Gas Company requirements and specifications. If not indicated otherwise, as follows:

B. Maintain separation of gas line from other utility piping in accordance with code.

C. Route piping in straight line.

D. Install piping to conserve space and not interfere with use of site space.

E. Install piping to allow for expansion and contraction without stressing pipe or joints.

F. Install valves and other fittings as indicated.

G. Establish elevations of buried piping with not less than 36 inches of cover.

H. Lay pipe on bedding.

I. Wrap couplings and fittings of steel pipe with polyethylene tape and heat shrink over pipe.

J. Install trace wire continuous above pipe line; coordinate with Section 31 20 00.

K. Backfill trench in accordance with Section 31 20 00.

L. Center and plumb valve box over valve. Set box cover flush with finished ground surface. Prevent shock or stress from being transmitted through valve box to valve.

M. Install Work in accordance with utility company standards.

3.5 SERVICE CONNECTIONS

A. Per the Gas Company requirements and specifications. If not indicated otherwise, as follows:

B. For plastic service pipe, use steel pipe riser from below ground to service connection.

C. Anchor service main to exterior surface of foundation wall.

D. Install service regulator adjacent to building wall in specified location.

E. Install service valve in yard box adjacent to building wall.

F. Install Work in accordance with utility company standards.

3.6 FIELD QUALITY CONTROL

A. Per the Gas Company requirements and specifications. If not indicated otherwise, as follows:

B. Section 01 43 00 - Quality Assurance: Field inspecting testing, adjusting, and balancing.

C. Pressure test gas lines to 60 psi for no less than 30 minutes.

D. When pressure tests do not meet specified requirements, remove defective work, replace and retest.

END OF SECTION

APPENDIX 1

GEOTECHNICAL REPORT

HAZARDOUS MATERIAL REMEDIATION REPORT

GEOTECHNICAL REPORT

APPENDIX 1

GEOTECHNICAL INVESTIGATION

PROPOSED COSTA MESA FIRE STATION NO. 2 REPLACEMENT

800 BAKER STREET

COSTA MESA, ORANGE COUNTY, CALIFORNIA

Prepared For **PBK ARCHITECTS**
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Project No. 038.0000024475

July 25, 2024

July 25, 2024

Project No. 038.0000024475

PBK Architects
8163 Rochester Avenue, Suite 100
Rancho Cucamonga, California 91730

Attention: Mr. Kelley Needham, AIA
Principal

Subject: Geotechnical Investigation
Proposed Costa Mesa Fire Station No. 2 Replacement
800 Baker Street
Costa Mesa, Orange County, California

Leighton Consulting, Inc. (Leighton) is pleased to present this geotechnical investigation report in support of the proposed Costa Mesa Fire Station No. 2 Replacement project to be located at 800 Baker Street in the City of Costa Mesa, Orange County, California. The purpose of our geotechnical investigation has been to evaluate the geologic hazards and geotechnical conditions of the site with respect to the proposed improvements and to provide geotechnical recommendations for design and construction.

The site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone and no known active faults have been mapped through or trending toward the site. However, as is the case for most of southern California, strong ground shaking has and will occur at this site. The site has been mapped to be outside of a State liquefaction susceptibility zone based on our review of Earthquake Zones of Required Investigations for the Newport Beach Quadrangle (see Figure 5, *Seismic Hazards Map*). The site has also been mapped by the State to have a historically highest groundwater table of approximately 20 feet below ground surface based on our review of the Seismic Hazard Report for the Anaheim and Newport Beach 7.5-Minute Quadrangle. Groundwater was encountered within 2 of our 4 borings at depths ranging from approximately 24 to 25 feet below ground surface.

Based on this investigation, the proposed fire station building may be founded on conventional spread footings bearing solely on a zone of newly excavated and

recompacted fill soils derived from onsite soils, overlying undisturbed native soils. This report addresses these and other geotechnical aspects of the project.

We appreciate this opportunity to be of additional service to PBK Architects. If you have any questions or if we can be of further service, please contact us at your convenience at ***866-LEIGHTON***, directly at the phone extensions or e-mail addresses listed below.

Respectfully submitted,

LEIGHTON CONSULTING, INC.



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BTM/AA/JAT

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Appendix D - General Earthwork and Grading Specifications for Rough Grading
Appendix E - GBA's Important Information About This Geotechnical-Engineering Report

1.0 INTRODUCTION

1.1 Site Location and Description

The proposed fire station is to be constructed within an approximately 0.8-acre property located at 800 Baker Street in the City of Costa Mesa, California (see Figure 1, *Site Location Map*). The proposed fire station site is bounded by Randolph Avenue to the north, Baker Street to the south and multi-family residential properties to the east and west. Based on our review of the current elevation model from Google Earth and published topographic maps, the proposed fire station site is generally flat-lying at an elevation of approximately 37 to 40 feet above mean sea level (msl).

Based on our review of historical aerial imagery dating as far back as 1938 (NETR, 2024), the site was primarily open and undeveloped land until sometime between 1938 and 1952, when development began in and around the site vicinity for the development of single-family residential homes. Removal of the single-family homes and development of the existing fire station appeared to have occurred sometime between 1963 and 1972. The site has undergone only minor site improvements until present date.

1.2 Proposed Development

Our understanding of the project is based on email correspondence with you and the provided *Proposed Site Plan*, dated January 3, 2024. Preliminary site layouts depict an approximately 9,000-SF fire station building to replace the existing fire station building. The proposed structure will house new dormitories, bathrooms, offices, conference room, exercise room, day room, dining room/kitchen, laundry room, and a 3,725 SF apparatus bay within the central portion of the building. Also planned are two new equipment pads for a fuel tank and an emergency generator towards the southwestern portion of the site, an outdoor patio to the north side of the building. Visitor and crew parking lots, site fencing, sliding security gates, and a new driveway are also proposed. Ancillary improvements are anticipated to include landscaping, a trash enclosure, and associated underground utilities.

The proposed fire station replacement is to be constructed within the overall approximately 0.8-acre site and slated to replace the existing approximately 6,800-square-foot (SF) fire station building. We understand a temporary fire station and

apparatus bay are to be placed towards the northwest portion of the site until the replacement fire station has been completed.

Structural loading of the proposed building foundations has not been provided to us at the time of this report. We assume that the structures will be relatively lightly loaded.

1.3 Purpose and Scope of Exploration

The purpose of our exploration has been to: (1) evaluate geotechnical conditions of the site with respect to the proposed improvements, (2) identify significant geotechnical and geologic issues that would impact proposed improvements, and (3) provide preliminary geotechnical recommendations for design and construction of proposed improvements as currently planned. In accordance with our June 5, 2024, proposal, the scope of our exploration included the following:

- **Research**: We reviewed readily available maps, reports, and historical aerial photographs relevant to this project. Pertinent geotechnical documents are referenced at the end of this report text.

- **Field Exploration**: On June 17, 2024, four (4) hollow-stem auger borings (LB-1 through LB-4) were drilled with a truck-mounted drill rig, each logged and sampled to total depths ranging from approximately 10 feet to 51.5 feet below the existing ground surface (bgs). Encountered earth materials were logged in the field by our field representative and described in accordance with the Unified Soil Classification System (ASTM D2488). Relatively undisturbed soil samples were obtained at selected intervals within these borings using both a ring-lined Modified California split-barrel sampler and an unlined, 2-inch outside diameter Standard Penetration Test (SPT) split-spoon sampler. Although the SPT sampler we used had room for a liner, no liner was used as is customary for this type of work in this area. Sampling resistance blow counts were obtained by dropping a 140-pound, automatic-trip hammer through a 30-inch free fall onto a sampling rod anvil. Modified California and SPT samplers were driven 18 inches and the number of blows was recorded for each 6 inches of penetration. Both sampling methods generally followed respective ASTM D3550 and ASTM D1586 procedures. Representative bulk soil samples were also collected at shallow depths.

Infiltration testing was conducted within LB-3 and LB-4, which were converted into temporary wells IT-1 and IT-2, respectively. Testing was conducted at test zones located between 5 to 10 feet bgs for IT-1 and depths of 10 to 15 feet bgs for IT-2 to estimate the infiltration characteristics of the underlying soil at locations and depths tested. These infiltration tests were conducted in general conformance with Orange County Guidelines.

After drilling, sampling, logging, and infiltration testing, all borings were immediately backfilled with soils generated from drilling activities and patched at the surface with cold-mix asphalt to match existing conditions. Logs of our geotechnical borings and infiltration measurements collected in the field are presented in Appendix A, *Geotechnical Exploration Logs*. The approximate boring locations are shown on the accompanying Figure 2, *Exploration Location Map*.

- **Geotechnical Laboratory Testing**: Geotechnical laboratory tests were conducted on selected relatively undisturbed and bulk soil samples obtained during our field exploration. Our laboratory testing program was designed to evaluate engineering characteristics of onsite soils. A description of test procedures and results are presented in Appendix B, *Geotechnical Laboratory Testing*.

- **Engineering and Geologic Analysis**: Data obtained from our field exploration and geotechnical laboratory testing were evaluated and analyzed to develop geotechnical conclusions and provide recommendations.

- **Report Preparation**: Results of our geologic hazards review and geotechnical exploration have been summarized in this report, presenting our findings, conclusions, and preliminary geotechnical design recommendations.

This report does not address the potential for encountering hazardous materials in site soils or within groundwater. Important information about limitations of geotechnical reports in general, is presented in Appendix E, *GBA's Important Information About This Geotechnical-Engineering Report*.

2.0 FINDINGS

2.1 Regional Geologic Setting

The project is located in the Peninsular Ranges geomorphic province of southern California, on the Newport Mesa of the Los Angeles Basin in western Orange County (Yerkes et al., 1965). The Newport Mesa is located east of the current channel of the Santa Ana River and west and north of Newport Bay. This mesa is composed of Pleistocene age tidal flat deposits that have been uplifted by the Quaternary development of the northwest-plunging San Joaquin Hills anticline. The dextral Newport-Inglewood-Rose Canyon fault zone trends along this anticlinal axis and its potentially active segments are located as close as approximately 1.7-mile southwest of Costa Mesa Fire Station No. 2. The San Joaquin Hills thrust fault is located approximately 0.8-miles north of the site.

Figure 4, *Regional Fault and Historical Seismicity Map* illustrates regional active and potentially active fault traces with respect to the site location.

2.2 Subsurface Soil Conditions

Based on results of our research and subsurface exploration, site soils encountered to the depths explored (51.5 feet bgs) consisted of the following:

- **Undocumented Fill (Afu)**: We are unaware of any documentation of previous fill placement for this site, so we have characterized all fill onsite as undocumented. Undocumented artificial fill was encountered in our borings to be generally about 5 to 7.5 feet thick. Undocumented fill encountered in our borings consisted primarily of very stiff, reddish brown sandy clay (CL).

- **Old Paralic Deposits overlain by Alluvial-Fan Deposits (Qopf)**: The site has been regionally mapped to be underlain by old paralic deposits that have been overlain by alluvial fan deposits. These soils were encountered in our borings below undocumented fill and consisted generally of medium stiff to very stiff sandy silt and clay with sand to explored depths, Occasional interbedded sand and silty sand were encountered. Moisture contents from the underlying alluvial soils within the upper 10 feet ranged from values of 10 to 21 percent moisture and in situ dry densities ranged from 103 to 119 pcf.

More detailed descriptions of subsurface soils encountered are presented on our boring logs in Appendix A.

2.3 Groundwater

Groundwater was encountered in 2 of our 4 borings (LB-1 and LB-2) drilled on June 17, 2024, at depths ranging from approximately 24 to 25 feet below the existing ground surface (bgs). According to the Seismic Hazard Zone Report for the Anaheim and Newport Beach 7.5-Minute Quadrangles (CGS, 1997), the historically highest groundwater level at the site was on the order of 20 feet below ground surface.

Based on our borings and historical groundwater data, groundwater is not expected to be a significant constraint for development nor is anticipated to be encountered during construction activities for the proposed fire station building.

2.4 Faulting and Seismicity

Southern California is a seismically active area. As such, the site will be subject to seismic hazards from numerous sources in the area. The severity of potential seismic hazards is related to site-specific geology, distances from seismic sources, and the magnitude of earthquake events. Principal seismic hazards evaluated on a site-specific basis included: potential for surface rupture along active or potentially active fault traces, magnitude of seismic shaking, and the susceptibility to ground failure (liquefaction, lurching, and seismically induced landslides). Site-specific faulting and seismicity considerations are discussed in the following two subsections:

2.4.1 Surface Fault Rupture: Fault classification criteria adopted by the California Geological Survey, formerly the California Division of Mines and Geology, defines Earthquake Fault Zones along active or potentially active faults. The California Alquist-Priolo Earthquake Fault Zoning Act of 1972 classification system is used in this report, as follows:

- **Active**: An active fault is one that has ruptured within the Holocene epoch (the last 11,700 years).
- **Potentially Active**: A fault that has ruptured during the last 1.8 million years (Quaternary period) but has not been proven by direct evidence to have not moved within the Holocene epoch is considered to be potentially active.

- **Inactive**: A fault that has not moved during both Pleistocene and Holocene epochs (that is, no movement within the last 1.8 million years) is considered to be inactive.

This project lies outside of any State designated Earthquake Fault Zones (CGS, 1998). Based on our review of available in-house literature, and as depicted on Figure 4, *Regional Faults and Historical Seismicity Map*, there are no currently known active fault traces that traverse or trend towards this site. The Third California Earthquake Rupture Forecast (UCERF3) has estimated locations of potential fault rupture outside or trending outside the project site.

The closest known active or potentially active fault is the San Joaquin Hills blind thrust located approximately 0.8 mile north of the project site. Other known regional active or potentially active faults that could produce the most significant ground shaking at the site include those related to the Newport-Inglewood fault zone, the Palos Verde fault zone, and the Elsinore fault zone.

Nearby fault traces have been depicted in Figure 4, *Regional Fault and Historical Seismicity Map*.

2.4.2 Seismicity (Ground Shaking): A principal seismic hazard that could impact this site is ground shaking resulting from an earthquake occurring along several major active or potentially active faults throughout southern California. An evaluation of historical seismicity from significant past earthquakes related to the site was performed. Plotted on Figure 4, *Regional Fault and Historical Seismicity Map*, are epicenters of historic earthquakes in and around Costa Mesa, color-coded as a function of magnitude. Based on this map, it appears that the site has not been exposed to relatively significant seismic events. We are unaware of documentation indicating that past earthquake damage has occurred in the site vicinity. In addition, we are unaware of damage in the site vicinity as the result of liquefaction, lateral spreading, or other related phenomena.

2.5 Secondary Seismic Hazards

In general, secondary seismic hazards for sites in this region could include soil liquefaction, earthquake-induced settlement, slope instability and landslides, earthquake-induced seiches and tsunamis flooding. Site-specific potential for secondary seismic hazards is discussed in the following subsections:

2.5.1 Liquefaction Potential: Liquefaction is the loss of soil strength due to a buildup of excess pore-water pressure during strong and long-duration ground shaking. Liquefaction is associated primarily with loose (low density), saturated, relatively uniform fine- to medium-grained, clean cohesionless soils. As shaking action of an earthquake progresses, soil granules are rearranged, and the soil densifies within a short period. This rapid densification of soil results in a buildup of pore-water pressure. When the pore-water pressure approaches the total overburden pressure, soil shear strength reduces abruptly and temporarily behaves similar to a fluid. For liquefaction to occur there must be:

(1) loose, clean granular soils,
(2) shallow groundwater, **and**
(3) strong, long-duration ground shaking

The State of California has evaluated the site for liquefaction hazards and the site is **not** within a mapped liquefaction susceptibility zone (CGS, 1998). Groundwater was encountered in our borings at a depth of approximately 24 feet bgs. The site has been mapped with the historically highest groundwater table on the order of 20 feet below ground surface based on our review of the Seismic Hazard Report for the Anaheim and Newport Beach 7.5-Minute Quadrangle (CGS, 1997).

Our analysis was based on the modified Seed Simplified Procedure as detailed by Youd et al. (2001) and Martin and Lew (1999), which compares the seismic demand on a soil layer (Cyclic Stress Ratio, or CSR) to the capacity of the soil to resist liquefaction (Cyclic Resistance Ratio, or CRR) (Youd et al., 2001). A minimum required factor of safety of 1.3 was used in our analysis, with factor of safety defined as CRR/CSR. As required, our analysis assumes that the design earthquake would occur while the groundwater is at its estimated historically highest level. In the SPT method, soil resistance to liquefaction is estimated based on several factors, including SPT sampling blow counts normalized and corrected for several factors including fines content, and overburden pressure. Soil plasticity and moisture content are also considered in an evaluation of liquefaction. Parameters utilized in our analysis include

Standard Penetration Test (SPT) results from the borings, visual descriptions of soil samples retrieved, and geotechnical laboratory test results.

Due to relatively dense nature of the underlying soils, and the presence of cohesive fine-grained soils (silts and clays) which were screened for liquefaction susceptibility (Bray and Sancio, 2006), the underlying subsurface soils are **not** considered susceptible to liquefaction when considering a design historic high groundwater depth of 20 feet bgs and corresponding peak ground acceleration.

2.5.2 Lateral Spreading: Lateral spreading is unlikely to occur at the site due to the lack of liquefaction potential and lack of significant topographic relief at and around this site.

2.5.3 Seismically Induced Settlement: During a strong seismic event, non-liquefaction, seismically induced settlement can occur within loose and dry granular soils. Settlement caused by ground shaking is often unevenly distributed, which can result in differential settlement. Loose fill soils are typically highly susceptible to seismically induced settlement. Undocumented fill soils under the proposed building footprint are recommended (discussed later in this report) to be overexcavated and recompacted to reduce dynamic settlement concerns.

We have performed analyses to estimate the potential for seismically induced settlement using the method of Tokimatsu and Seed, and based on Martin and Lew (1999), considering the maximum considered earthquake (MCE) peak ground acceleration (PGA_M). Design/historic high groundwater levels of 20 feet below ground surface were used in the analysis. Based on our analysis, a potential for approximately 0.1 inch of seismic settlement is estimated at the site. Results of our seismic settlement analysis is presented in Appendix C.

If the potential differential settlement is estimated as half of the total seismic settlement over a horizontal distance of 30 feet, this would result in a maximum differential settlement of under 0.1 inch in 30 feet, or angular distortion of 0.00014L. This would be within the differential settlement threshold of 0.002L for structures of Risk Category IV, as listed in Table 12.13-3 of ASCE 7-16. The structural engineer should determine Structure Type and Risk Category and evaluate whether the differential settlement estimates described above are tolerable. A copy of ASCE 7-16 Table 12.13-3 is provided as follows for

reference.

Table 12.13-3 Differential Settlement Threshold

Structure Type	Risk Category		
	I or II	III	IV
Single-story structures with concrete or masonry wall systems	0.0075L	0.005L	0.002L
Other single-story structures	0.015L	0.010L	0.002L
Multistory structures with concrete or masonry wall systems	0.005L	0.003L	0.002L
Other multistory structures	0.010L	0.006L	0.002L

2.5.4 Slope Instability and Landslides: Seismically induced landslides and other slope failures are common occurrences during or soon after earthquakes. The site has been mapped by the State to **not** be within a landslide hazard zone based on our review of Earthquake Zones of Required Investigations for the Newport Beach Quadrangle (CGS, 1998). Considering the site and vicinity are relatively flat, the potential for seismically induced landslide activity is less than significant.

2.5.5 Earthquake-Induced Seiches and Tsunamis: Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Tsunamis are predominately ocean waves generated by undersea large magnitude fault displacement or major ground movement.

The site is located approximately 5 miles inland from the Pacific Ocean and is mapped outside of a tsunami hazard area as delineated by the State of California (CGS, 2021). There are no large nearby enclosed bodies of water in relation to the project site. Thus, the risk of seiches and tsunamis affecting the site is considered low.

2.5.6 Earthquake-Induced Inundation: This inundation hazard is flooding caused by failure of dams or other water-retaining structures as a result of earthquakes. Figure 7, *Dam Breach Inundation Map*, shows the subject **not** mapped within a dam breach inundation zone. Based on our review of available data, the potential for an earthquake induced inundation event is considered low.

2.6 Storm-Induced Flood Hazard

As depicted on Figure 6, *Flood Hazard Zone Map*, the site is mapped outside of a "100-year" flood zone; however, the northernmost portion of the site **is** mapped within a 0.2% Annual Flood Hazards zone also referred to as a "500-year" flood zone, as defined by the Federal Emergency Management Agency's (FEMA's) Flood Insurance Rate Map (FIRM). Based on our review FEMA's FIRM map number 06059C02675 J (FEMA 2009) the site is mapped within Zone X "Other Flood Areas" which indicates the site is an area of 0.2% annual chance flood; area of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile and protected by levees from 1% annual chance flood. This corresponds to the nearby Santa Ana Delhi Channel which is located approximately 1,900 feet east of the project site. As such, the risk of flood hazards is considered minor, but the potential risk should be considered during the design of the proposed fire station.

2.7 Infiltration Testing

Infiltration testing was conducted within two of our borings onsite (LB-3/IT-1 and LB-4/IT-2) to estimate the infiltration characteristics of the onsite soils at the depths and locations tested. Infiltration testing was conducted with bottom test zone depths of approximately 15 feet bgs within boring IT-1 and 10 feet bgs within boring IT-2.

Borehole infiltration tests are useful for field measurements of soil infiltration rates, and are suited for testing when the design depth of the basin or chamber is deeper than current existing grades. It should be noted that this is a clean-water, small-scale test, and that correction factors need to be applied. A test consists of excavating a boring to the depth of the test (or deeper as long as it is partially backfilled with soil and a bentonite plug with a thin soil covering is placed just below the design test elevation). A layer of clean sand or gravel is then placed in the boring bottom to temporarily support a perforated well casing pipe system. Once the well casing pipe has been installed, coarse sand or gravel is poured in the annular space outside of the well casing within the test zone to prevent the boring from caving/collapsing or spalling when water is added. Water is added into the boring to an initial height. As water infiltrates into the soils, measurements are taken of the height of the water column at equally timed intervals (known as falling head test). We also conducted a constant water head by adding water to the borings as water infiltrated into the soil, while maintaining a relatively constant water head in the boring. The incremental infiltration rate as measured during

intervals of the test was defined as the incremental flow rate of water infiltrated, divided by the surface area of the infiltration interface. Well permeameter tests were conducted based on USBR 7300-89 method and in general accordance with Orange County guidelines.

Raw Infiltration rates for the well permeameter test yielded a rate of 26 inches/hour within Boring TI-2; however, confining fine grained soil layers (silts and clay) were encountered at depths as shallow as 12.5 feet bgs within the immediate area and as shown within our borings logs conducted at the site. Results of infiltration testing are provided in Appendix A. Further discussion of infiltration testing and related recommendations are included in Section 3.12.

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 Conclusions

This site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone for surface fault rupture. However, as is the case for most of southern California, the most significant geotechnical issue at the site is related to the potential for strong seismic shaking. Historic groundwater levels have been estimated to be on the order of 20 feet below the surface based on the Seismic Hazard Report for the Anaheim and Newport Beach 7.5-Minute Quadrangle Report (CGS, 1997). Based on our analysis and the relatively dense nature of the underlying soils, the potential for liquefaction and seismic induced settlement is considered low at this site. The northern portion of the site is mapped within a 500-year flood zone and special consideration of this occurrence should be taken into consideration during design of the project. Recommendations for design and construction of proposed improvements are provided in the following sections.

The recommendations below are based upon the exhibited geotechnical engineering properties of the soils and their anticipated response both during and after construction. These recommendations are also based upon proper field observation and testing during construction. The project geotechnical engineer should be notified of suspected variances in field conditions to evaluate the effect upon the recommendations presented herein. These recommendations are considered minimal and may be superseded by more restrictive requirements of the civil and structural engineers, the County of Orange, and other governing agencies.

3.2 Earthwork

Project earthwork is expected to include overexcavation and recompaction of undocumented fill soils, and partial removals of onsite alluvial soils, below the proposed new building footprint as described in the following subsections:

3.2.1 Earthwork Observation and Testing: Leighton should observe and test all grading and earthwork to check that the site has been properly prepared, to assess that selected fill materials are satisfactory, and to evaluate that placement and compaction of fills has been performed in accordance with our

recommendations and the project specifications. Any imported soil or aggregate material to be evaluated for its suitability as onsite fill material should be submitted to a Leighton geotechnical laboratory at least two working days in advance of earth material placement and compaction. Project plans and specifications should incorporate recommendations contained in the text of this report.

Variations in site conditions are possible and may be encountered during construction. To confirm correlation between soil data obtained during our field and laboratory testing and actual subsurface conditions encountered during construction, and to observe conformance with approved plans and specifications, we should be retained to perform continuous or intermittent review during earthwork, excavation, and foundation construction phases. Conclusions and recommendations presented in this report are contingent upon construction geotechnical observation services.

3.2.2 **Site Preparation:** Prior to construction, the site should be cleared of vegetation, trash and debris, which should be disposed of offsite. Any underground obstructions should be removed. Resulting cavities should be properly backfilled and compacted. Efforts should be made to locate existing utility lines. Those lines should be removed or rerouted if they interfere with the proposed construction, and the resulting cavities should be properly backfilled and compacted. Unsuitable deposits and undocumented fill should be excavated and removed from the proposed building footprints prior to fill placement. Removal of these unsuitable deposits and undocumented fill should be as recommended by Leighton Consulting during grading and further evaluated based on the foundation system.

Based on encountered soil conditions, we recommend that all existing fill to be completely removed, which were found to be generally 3 to 5 feet thick in our exploratory borings, but locally thicker undocumented fills are expected to be exposed during grading. Furthermore, potentially compressible native soils are recommended to be excavated below proposed building footprints to at least 3 feet below the bottoms of proposed footings or at least 5 feet below existing grade, whichever is deeper. Overexcavation bottoms should be evaluated by Leighton, and localized deeper removals may be recommended during grading based on exposed conditions.

Where possible, overexcavation bottoms should extend horizontally a distance beyond the outside edges of proposed building perimeter footings equal to the depth of excavation below finish grade or at least 5 feet horizontally, whichever is greater. Where this is not achievable, overexcavation should be reviewed on a case-by-case basis. Overexcavation should encompass the whole new building footprint including attached columns.

Areas outside proposed building pads, planned for asphalt and/or concrete pavement, should be overexcavated to a minimum depth of 24 inches below existing or finish grade, or 12 inches below proposed pavement sections; whichever is deeper.

Resulting removal excavation bottom surfaces should be observed by Leighton prior to placement of any backfill or new construction. It is essential that all existing fill soils be excavated from the proposed building footprints, regardless of depth. After overexcavation is completed and prior to fill placement, exposed surfaces should be scarified to a minimum depth of 6 inches, moisture conditioned to 3 percentage points above optimum moisture content, and recompacted to a minimum 90 percent relative compaction as determined by ASTM D1557 standard test method (modified Proctor compaction curve).

3.2.3 Fill Placement and Compaction: Onsite soils free of organics and debris are suitable for use as compacted structural fill provided it is also free of oversized material (greater than 8 inches in its largest dimension). However, any soil to be placed as fill, whether onsite or imported material, should be first viewed by Leighton and then tested if and as necessary, prior to approval for use as compacted fill. All structural fill should be free of hazardous materials.

All fill soil should be placed in thin, loose lifts, moisture-conditioned, as necessary, to at least 3 percentage points above optimum moisture content and compacted to a minimum 90% relative compaction as determined by ASTM D1557 standard test method (modified Proctor compaction curve) within the building footprint. Aggregate base for pavement sections should be compacted to a minimum of 95% relative compaction.

No debris or oversize cobbles were observed at the site during our exploration. If oversize material and debris are encountered during grading or during demolition of the existing fire station building and associated features onsite, it

should be removed from soils prior to placement as compacted fill.

3.2.4 Shrinkage or Bulking: The change in volume of excavated and recompacted soil varies according to soil type and location. This volume change is represented as a percentage increase (bulking) or decrease (shrinkage) in volume of fill after removal and recompaction. Subsidence occurs as in-place soil (e.g., natural ground) is moisture-conditioned and densified to receive fill, such as in processing an overexcavation bottom. Subsidence is in addition to shrinkage due to recompaction of fill soil. Based on our laboratory test results for the underlying soils at the site we estimate the following earth volume changes will occur during grading:

Shrinkage and Subsidence	
Shrinkage	Approximately 3 +/- 5 percent
Subsidence (overexcavation bottom processing)	Approximately 0.1 foot

The level of fill compaction, variations in the dry density of the existing soils and other factors influence the amount of volume change. Some adjustments to earthwork volume should be anticipated during grading of the site.

3.3 Seismic Design Parameters

The site will experience strong ground shaking after the proposed project is developed resulting from an earthquake occurring along one or more of the major active or potentially active faults in southern California. Accordingly, the project should be designed in accordance with all applicable current codes and standards utilizing the appropriate seismic design parameters to reduce seismic risk as defined by California Geological Survey (CGS) Chapter 2 of Special Publication 117a (CGS, 2008). Through compliance with these regulatory requirements and the utilization of appropriate seismic design parameters selected by the design professionals, potential effects relating to seismic shaking can be reduced.

The following parameters should be considered for design under the 2022 CBC:

Table 1. 2022 CBC Site-Specific Seismic Parameters

2022 CBC Parameters (CBC or ASCE 7-16 reference)	Value 2022 CBC
Site Latitude and Longitude: 33.6806, -117.8899	
Site Class Definition (1613.2.2, ASCE 7-16 Ch 20)	D**
Mapped Spectral Response Acceleration at 0.2s Period (1613.2.1), S_S	1.301 g
Mapped Spectral Response Acceleration at 1s Period (1613.2.1), S_1	0.466g
Short Period Site Coefficient at 0.2s Period (T1613.2.3(1)), F_a	1.000
Long Period Site Coefficient at 1s Period (T1613.2.3(2)), F_v	1.834*
Adjusted Spectral Response Acceleration at 0.2s Period (1613.2.3), S_{MS}	1.301 g
Adjusted Spectral Response Acceleration at 1s Period (1613.2.3), S_{M1}	0.855* g
Design Spectral Response Acceleration at 0.2s Period (1613.2.4), S_{DS}	0.867 g
Design Spectral Response Acceleration at 1s Period (1613.2.4), S_{D1}	0.570* g
Mapped MCE_G peak ground acceleration (11.8.3.2, Fig 22-9 to 13), ***PGA***	0.558 g
Site Coefficient for Mapped MCE_G *PGA* (11.8.3.2), F_{PGA}	1.100
Site-Modified Peak Ground Acceleration (1803.5.12; 11.8.3.2), PGA_M	0.614 g

* See Section 11.4.8 of ASCE 7-16. A site-specific ground motion hazard analysis in accordance with Section 21.2 of ASCE 7-16 is required for this site. **Per Supplement 3 to ASCE 7-16, a site-specific ground motion hazard analysis is not required where the value of the parameters SM_1 and SD_1 in the table are increased by 50%.**

** Site Class D, and all of the resulting parameters in this table, may only be used for structures without seismic isolation or seismic damping systems.

A Site Class analysis is included in Appendix C in accordance with ASCE 7-16 Chapter 20. Subsurface data below 50 feet was conservatively estimated using Standard Penetration Test (SPT) blowcounts from our deepest boring. Hazard deaggregation was estimated using the USGS Interactive Deaggregations utility. The results of this analysis indicate that the predominant modal earthquake has a magnitude of approximately 7.69 (M_W) at a distance on the order of 6.58 kilometers for the Maximum Considered Earthquake (2% probability of exceedance in 50 years.

3.4 Foundations

Based on our exploration and our experience in the region, onsite soils exposed at pad grade are anticipated to exhibit a low expansive potential. As such, we recommend that the proposed structures be supported on conventional shallow

spread or strip footings foundation system in accordance with the California Building Code (CBC). Anticipated foundation loads were not available during preparation of this report. We assumed maximum column dead loads up to (≤) 50 kips and wall loads of 3 kips per lineal foot for our preliminary foundation recommendations. Overexcavation and recompaction of footing subgrade soils should be performed as detailed in Section 3.2 of this report. Shallow foundation recommendations are provided in the following section.

3.4.1 Minimum Embedment and Width

Based on our preliminary investigation, footings should have a minimum embedment per code requirements, with a minimum width of 24 and 12 inches for isolated and continuous footings, respectively

3.4.2 Allowable Bearing

An allowable bearing pressure of 2,000 pounds-per-square-foot (psf) may be used, based on an assumed embedment depth of 18 inches and minimum width described above. This allowable bearing value may be increased by 250 psf per foot increase in depth or width to a maximum allowable bearing pressure of 3,000 psf. If higher bearing pressures are required, this should be reviewed on a case-by-case basis and may include additional overexcavation and/or soil reinforcement. These allowable bearing pressures are for total dead load and sustained live loads. Footing reinforcement should be designed by the structural engineer.

3.4.3 Lateral Load Resistance

Soil resistance available to withstand lateral loads on a shallow foundation is a function of the frictional resistance along the base of the footing and the passive resistance that may develop as the face of the structure tends to move into the soil. The frictional resistance between the base of the foundation and the subgrade soil may be computed using a coefficient of friction of 0.30. The passive resistance may be computed using an allowable equivalent fluid pressure of 240 pounds per cubic foot (pcf), assuming there is constant contact between the footing and undisturbed soil. The coefficient of friction and passive resistance may be combined without further reduction.

3.4.4 Increase in Bearing and Friction – Short Duration Loads

The allowable bearing pressure and coefficient of friction values may be increased by one-third when considering loads of short duration, such as those imposed by wind and seismic forces.

3.4.5 Settlement Estimates

The recommended allowable bearing pressure is generally based on a total allowable, post-construction static settlement of 1 inch. Differential settlement due to static loading is estimated at ½ inch over a horizontal distance of 30 feet. Since settlement is a function of footing sustained load, size and contact bearing pressure, differential settlement can be expected between adjacent columns or walls where a large differential loading condition exists.

3.5 Concrete Slab-On-Grade

Concrete slabs-on-grade should be designed by the structural engineer in accordance with 2022 CBC requirements for soil with a low expansion potential. More stringent requirements may be required by the structural engineer and/or architect; however, slabs-on-grade should have the following minimum recommended components:

- **Subgrade:** Slab-on-grade subgrade soil should be moisture conditioned to or within 3% over optimum moisture content, to a minimum depth of 24 inches within building footprints, and compacted to 95% of the modified Proctor (ASTM D1557) laboratory maximum density prior to placing either a moisture barrier, steel and/or concrete.

- **Moisture Barrier:** A moisture barrier consisting of at least 15-mil-thick Stego-wrap vapor barriers (see: http://www.stegoindustries.com/products/stego_wrap_vapor_barrier.php), or equivalent, should then be placed below slabs where moisture-sensitive floor coverings or equipment will be placed.

- **Reinforced Concrete**: A conventionally reinforced concrete slab-on-grade with a thickness of at least 4 inches should be placed in pedestrian areas without heavy loads. Reinforcing steel should be designed by the structural engineer, but as a minimum should be No. 4 rebar placed at 18 inches on-center, each direction (perpendicularly), mid-depth in the slab. A modulus of subgrade reaction (k) as a linear spring constant, of 90 pounds per square inch per inch deflection (pci) can be used for design of heavily loaded slabs-on-grade, assuming a linear response up to deflections on the order of ¾ inch.

- **Slab-On-Grade Control Joints**: Slab-on-grade crack control joint locations and spacing should be designed by the project Structural Engineer (SE). We suggest control joints of 12 feet on center. Control joints should form square panels.

Minor cracking of the concrete as it cures, due to drying and shrinkage, is normal and should be expected. However, cracking is often aggravated by a high water/cement ratio, high concrete temperature at the time of placement, small nominal aggregate size, and rapid moisture loss due to hot, dry, and/or windy weather conditions during placement and curing. Cracking due to temperature and moisture fluctuations can also be expected. Low slump concrete can reduce the potential for shrinkage cracking. Additionally, our experience indicates that reinforcement in slabs and foundations can generally reduce the potential for concrete cracking. The structural engineer should consider these components in slab design and specifications.

Moisture retarders can reduce, but not eliminate moisture vapor rise from the underlying soils up through the slab. Floor covering manufacturers should be consulted for specific recommendations.

Leighton does not practice in the field of moisture vapor transmission evaluation, since this is not specifically a geotechnical issue. Therefore, we recommend that a qualified person, such as the flooring subcontractor and/or structural engineer, be consulted with to evaluate the general and specific moisture vapor transmission paths and any impact on the proposed construction. That person should provide recommendations for mitigation of potential adverse impact of moisture vapor transmission on various components of the structures as deemed appropriate.

3.6 Sulfate Attack and Ferrous Corrosion Protection

3.6.1 Sulfate Exposure: Sulfate ions in the soil can lower the soil resistivity and can be highly aggressive to Portland cement concrete by combining chemically with certain constituents of the concrete, principally tricalcium aluminate. This reaction is accompanied by expansion and eventual disruption of the concrete matrix. A potentially high sulfate content could also cause corrosion of reinforcing steel in concrete. Section 1904A of the 2022 California Building Code (CBC) defers to the American Concrete Institute's (ACI's) ACI 318-19 for concrete durability requirements. Table 19.3.1.1 of ACI 318-19 lists "*Exposure categories and classes*," including sulfate exposure as follows:

Table 2. Sulfate Concentration and Exposure

Soluble Sulfate in Water (parts-per-million)	Water-Soluble Sulfate (SO_4) in soil (percentage by weight)	ACI 318-19 Sulfate Class
0-150	0.00 - 0.10	S0 (negligible)
150-1,500	0.10 - 0.20	S1 (moderate*)
1,500-10,000	0.20 - 2.00	S2 (severe)
>10,000	>2.00	S3 (very severe)

*or seawater

3.6.2 Ferrous Corrosivity: Many factors can modify corrosion potential of soil including soil moisture content, resistivity, permeability and pH, as well as chloride and sulfate concentration. In general, soil resistivity, which is a measure of how easily electrical current flows through soils, is the most influential factor. Based on the findings of studies presented in ASTM STP 1013 titled "*Effects of Soil Characteristics on Corrosion*" (February 1989), the approximate relationship between soil resistivity and soil corrosiveness was developed as follows:

Table 3. Soil Resistivity and Soil Corrosivity

Soil Resistivity (ohm-cm)	Classification of Soil Corrosiveness
0 to 900	Very Severely Corrosive
900 to 2,300	Severely Corrosive
2,300 to 5,000	Moderately Corrosive
5,000 to 10,000	Mildly Corrosive
10,000 to >100,000	Very Mildly Corrosive

Acidity is an important factor of soil corrosivity. The lower the pH (the more acidic the environment), the higher the soil corrosivity will be with respect to buried metallic structures and utilities. As soil pH increases above 7 (the neutral value), the soil is increasingly more alkaline and less corrosive to buried steel structures, due to protective surface films, which form on steel in high pH environments. A pH between 5 and 8.5 is generally considered relatively passive from a corrosion standpoint. Chloride and sulfate ion concentrations, and pH appear to play secondary roles in modifying corrosion potential. High chloride levels tend to reduce soil resistivity and break down otherwise protective surface deposits, which can result in corrosion of buried steel or reinforced concrete structures.

3.6.3 Corrosivity Estimates: To evaluate corrosion potential of soils sampled from this site, we tested a bulk soil sample for soluble sulfate content, soluble chloride content, pH and resistivity. Results of these tests are summarized below:

Table 4. Results of Corrosivity Testing

Locations	Sample Depth (feet)	Sulfate (mg/kg)	Chloride (mg/kg)	pH	Minimum Resistivity (ohm-cm)
Boring LB-2	0 - 5	99	120	9.1	1,620

Note: mg/kg = milligrams per kilogram, or parts-per-million (ppm)

These results are discussed as follows:

- **Sulfate Exposure**: Based on recovered near surface soils and Table 19.3.1.1 of ACI 318-19, in our opinion, sulfate exposure should be considered "negligible" with an Exposure Class S0 for soils sampled at the site. Based on Table 19.3.2.1 of ACI 318-19, for this Exposure Category S0, there would be no restrictions on cement type ("cementitious material") nor water/cement ratio, and an f_c' (28-day compressive strength) of at least 2,500 pounds per square inch (psi) is required at a minimum for structural concrete.
- **Ferrous Corrosivity**: As shown above, minimum soil resistivity of 1,620 ohm-centimeters was measured in our laboratory test. In our opinion, it appears for site soils that corrosion potential to buried steel may be characterized as "severely corrosive" at the site. Ferrous pipe buried in moist to wet site earth materials may be replaced by high-density polyethylene (HDPE) or other non-ferrous pipe when possible. Or ferrous pipe may be protected by polyethylene bags, tap or coatings, di-electric fittings or other means to separate the pipe from on-site earth materials. A corrosion engineer may also be consulted to further evaluation for more detailed recommendations relating to onsite soil corrosion characteristics.

3.7 Pavement Section Design

Based on design procedures outlined in the 2017 Caltrans *Highway Design Manual* and a design R-value of less than 5 for onsite subgrade soils based on laboratory testing, preliminary flexible pavement sections were calculated for the Traffic Indices (TIs) tabulated, and are listed below:

Table 5. Hot Mixed Asphalt (HMA) Pavement Sections

Assumed Traffic Index	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
5.0 (automobile parking, driveways)	3.0	10.0
6.0 (truck traffic)	4.0	11.5
7.0 (roadways and heavy truck traffic)	6.0	12.0

For fire truck (60,000-pound “apparatus”) lanes, asphalt pavements designed for a TI=6.0 are recommended. However, note that undistributed apparatus outrigger loads could cause local asphalt pavement punching damage. When possible, outrigger loads should be distributed over asphalt pavements with planks and plywood. Otherwise, areas where outrigger loads are anticipated could be paved with 8-inch-thick concrete as described below.

Onsite clays are expected to have a low expansive potential, and R-value test on a near-surface sample was low (R<5). A subgrade sample should be collected during grading to perform additional R-Value tests to verify pavement design. Alternatively, in order to reduce the pavement section thicknesses provided in the table above, the subgrade soils can be cement-treated. We recommend that additional samples be collected during construction for R-Value testing, and also to determine the ideal cement treatment ratio (typically on the order of 3 to 5 percent). The following table provides pavement sections for cement-treated subgrade.

Table 6. Hot Mixed Asphalt (HMA) Pavement Sections
Cement Treated Subgrade*

Assumed Traffic Index	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
5.0 (automobile parking, driveways)	3.0	5.5
6.0 (truck traffic)	3.5	7.5
7.0 (roadways and heavy truck traffic)	4.0	9.5

*subgrade treated with 3%-5% cement

Portland cement concrete (PCC) pavement sections were calculated in accordance with procedures developed by the Portland Cement Association. Concrete paving sections for three Traffic Indices (TIs) are presented below:

Table 7. Portland Cement Concrete Pavement Sections

Assumed Traffic Index	PC Concrete (inches)	Base Course (inches)
5.0 (automobile parking, driveways)	6	8
6.0 (roadways and truck traffic)	8	

We have assumed that this Portland cement concrete will have a compressive strength of at least 3,000 psi. Prior to placement of aggregate base, subgrade soils should be scarified to a minimum depth of 8 inches, moisture-conditioned, as necessary, and recompacted to a minimum of 95 percent relative compaction, determined in accordance with ASTM D1557 modified Proctor laboratory maximum density. Aggregate base should be placed in thin lifts; moisture conditioned, as necessary, and compacted to a minimum of 95 percent relative compaction. Field observation and periodic testing, as needed during placement of base course materials, should be undertaken to ensure that requirements of current Caltrans' *Standard Specifications* and Special Provisions are fulfilled. Consideration should be given to reinforce concrete pavements where large outrigger point loads are anticipated.

Adequate drainage (both surface and subsurface) should be provided such that the subgrade soils and aggregate base materials are not allowed to become wet. All pavement construction should be performed in accordance with the current Caltrans *Standard Specifications* or *Standard Specifications for Public Works Construction* ("Greenbook"). Recommended structural pavement materials should conform to the specified provisions in the current Caltrans *Standard Specifications* including grading and quality requirements, shown below:

- **Asphalt Concrete (Hot Mixed Asphalt)** for pavement should be Type A and should conform to Section 39 of the *Standard Specifications*. Asphalt concrete specimens should be tested for surface abrasion in accordance with CT-360.
- **Portland Cement Concrete (PCC)** pavement should conform to Section 40 of the *Standard Specifications*. PCC pavement materials (pavement, structures, minor concrete) should conform to Section 90 of the *Standard Specifications*.
- **Class II Aggregate Base (AB)** should conform to Section 26 of the *Standard Specifications*.

Traffic Indices (TIs) used in our pavement design are considered reasonable values for typical parking lot areas, and should provide a pavement life of approximately 20 years with a normal amount of flexible pavement maintenance.

Irrigation adjacent to pavements, without a deep curb or other cutoff to separate landscaping from the paving, will result in premature pavement failure. Traffic parameters used for design were selected based on engineering judgment and not on information furnished to us such as an equivalent wheel-load analysis or a traffic study. The project Civil Engineer should confirm the TI assumptions.

3.8 Surface Drainage: Pad drainage should be designed to collect and direct surface water away from structures to approved drainage facilities. Hardscape drains should be installed and drain to approved storm water disposal systems. Drainage patterns and drainpipes approved at the time of fine grading should be maintained throughout the life of proposed structures.

3.9 Retaining Wall Recommendations

The following retaining wall recommendations are included for design consideration of walls with a height less than 6 feet. We recommend that retaining walls be backfilled with very low expansive soil and constructed with a backdrain in accordance with the recommendations provided on Figure 8, *Retaining Wall Backfill and Subdrain Detail*. Using expansive soil as retaining wall backfill will result in higher lateral earth pressures exerted on the wall and are, therefore, not recommended. Retaining wall locations and configurations are unknown at the time of this report.

Table 8. Retaining Wall Design Parameters

Static Equivalent Fluid Pressure (pcf)	
Condition	Level Backfill
Active	45
At-Rest (drained, compacted-fill backfill)	65
Passive (ultimate)	230 (Max. 3,000 psf)

The above values do not contain an appreciable factor of safety, so the structural engineer should apply the applicable factors of safety and/or load factors during design.

Cantilever walls that are designed to yield at least 0.001H, where H is equal to the wall height, may be designed using the active condition. Rigid walls and walls braced at the top should be designed using the at-rest condition.

Passive pressure is used to compute soil resistance to lateral structural movement. In addition, for sliding resistance, a frictional resistance coefficient of 0.35 may be used at the concrete and soil interface. The lateral passive resistance should be taken into account only if it is ensured that the soil providing passive resistance, embedded against the foundation elements, will remain intact with time. A soil unit weight of 120 pcf may be assumed for calculating the actual weight of the soil over the wall footing.

In addition to the above lateral forces due to retained earth, surcharge due to improvements, such as an adjacent structure or traffic loading, should be considered in the design of the retaining wall. Loads applied within a 1:1 projection from the surcharging structure on the stem of the wall should be considered in the design. A third of uniform vertical surcharge-loads should be applied at the surface as a horizontal pressure on cantilever (active) retaining walls, while half of uniform vertical surcharge-loads should be applied as a horizontal pressure on braced (at-rest) retaining walls. To account for automobile parking surcharge, we suggest that a uniform horizontal pressure of 100 psf (for restrained walls) or 70 psf (for cantilever walls) be added for design, where autos are parked within a horizontal distance behind the retaining wall less than the height of the retaining wall stem.

We recommend that the wall designs for walls 6 feet tall or taller be checked seismically using an *additive seismic* Equivalent Fluid Pressure (EFP) of 17 pcf, which is added to the EFP. The *additive seismic* EFP should be applied at the retained midpoint.

Conventional retaining wall footings should have a minimum width of 24 inches and a minimum embedment of 12 inches below the lowest adjacent grade. An allowable bearing pressure of 2,000 psf may be used for retaining wall footing design, based on the minimum footing width and depth. This bearing value may be increased by 250 psf per foot increase in width or depth to a maximum allowable bearing pressure of 3,000 psf.

3.10 Infiltration Recommendations

Based on our onsite observations, and infiltration test results summarized in the table below, reliance of infiltration into onsite near surface native soils is not considered feasible due to encountered fine grained soils (clays and silts) within the near surface soils and the mapped historical high groundwater table within the area.

Orange County Guidelines indicate that BMP system invert elevations need to have a minimum 10-foot vertical setback from historical groundwater elevations. As mentioned in Section 2.3, the historical high ground water level at the site is mapped to be approximately 20 feet bgs, resulting in an maximum allowable invert elevation of 10 feet bgs.

Although infiltration testing with a bottom depth of 10 feet bgs produced moderate rates for the test itself, soils with higher percent fines and fine-grained soils (silts and clays) were generally located above and below this very narrow test zone with favorable soils at depths ranging from 8 to 10 feet, causing a confining layer within neighboring borings. The very narrow clean sand layer (6% fines) was not encountered within any of our other borings onsite. It is likely that water infiltrated at depths of approximately 10 feet bgs through prolonged infiltration will tend to migrate laterally rather than vertically and produce lower infiltration values.

4.0 CONSTRUCTION CONSIDERATIONS

4.1 Trench Excavations

To protect workers entering excavations, all temporary excavations, including utility trenches, retaining wall excavations and other excavations should be performed in accordance with project plans, specifications and all OSHA and Cal-OSHA requirements, and the current edition of the California Construction Safety Orders.

No surcharge loads should be permitted within a horizontal distance equal to the height of cut or 5 feet, whichever is greater from the top of the slope, unless the cut is shored appropriately. Excavations that extend below an imaginary plane inclined at 45 degrees below the edge of any adjacent existing site foundation should be properly shored to maintain support of the adjacent structures.

Contractors should be advised that fill soils should initially be considered Type C soils as defined in the California Construction Safety Orders. As indicated in Table B-1 of Article 6, Section 1541.1, Appendix B, of the California Construction Safety Orders, excavations less-than (<) 20 feet deep within Type C soils should be sloped back no steeper than 1½:1 (horizontal:vertical), where workers are to enter the excavation. This may be impractical near adjacent existing utilities and structures; so shoring may be required depending on trench locations. Stiff undisturbed native clays will stand steeper.

During construction, the soil conditions should be regularly evaluated to verify that conditions are as anticipated. The contractor should be responsible for providing the "competent person" required by OSHA, standards to evaluate soil conditions. Close coordination between the competent person and the geotechnical engineer should be maintained to facilitate construction while providing safe excavations.

4.2 Temporary Shoring

Temporary cantilever shoring can be designed based on the active equivalent fluid pressure of 45 pounds-per-cubic-foot (pcf). If excavations are braced at the top and at specific depth intervals, then braced earth pressure may be approximated by a uniform rectangular soil pressure distribution. This uniform pressure

expressed in pounds-per-square-foot (psf), may be assumed to be 25 multiplied by H for design, where H is equal to the depth of the excavation being shored, in feet. These recommendations are valid only for trenches not exceeding 15 feet in depth at this site.

4.3 Trench Backfill

Utility trenches should be backfilled with compacted fill in accordance with Sections 306-1.2 and 306-1.3 of the *Standard Specifications for Public Works Construction* (SSPWC, "Greenbook"), 2024 Edition. Utility trenches may be backfilled with onsite material free of rubble, debris, organic and oversized material up to 3 inches in largest dimension. Prior to backfilling trenches, pipes should be bedded in and covered with either:

(1) **Granular Bedding:** a uniform sand material with a Sand Equivalent (SE) greater-than- or-equal-to (≥) 30, passing the No. 4 U.S. Standard Sieve (or as specified by the pipe manufacturer). Due to the possibility of shallow groundwater in select areas, sand bedding should not be jetted, but should be mechanically compacted in accordance with the Greenbook, latest edition.

(2) **CLSM:** Controlled Low Strength Material (CLSM) conforming to Section 201-6 of the SPWC. CLSM bedding should be placed to 1-foot (0.3 m) over the top of the conduit and vibrated.

We recommend that open-graded crushed rock or similar material not be used as bedding material, unless special provisions are implemented to limit the migration of surrounding soil into the open-graded material, including surrounding the open-graded material with filter fabric (Mirafi 140N or equivalent), or mixing sand with the open-graded material. Pipe bedding should extend at least 4 inches below the pipeline invert and at least 12 inches over the top of the pipeline. The bedding and shading sand is recommended to be densified in place by vibratory, lightweight compaction equipment.

Trench backfill over the pipe bedding zone may consist of native and clean fill soils. All backfill should be placed in thin lifts (appropriate for the type of compaction equipment), moisture conditioned to slightly above optimum, and mechanically compacted to at least 90 percent of the laboratory derived maximum density as determined by ASTM Test Method D 1557.

4.4 Geotechnical Services During Construction

Our geotechnical recommendations provided in this report are based on information available at the time the report was prepared and may change as plans are developed. Additional geotechnical exploration, testing and/or analysis may be required based on final plans. Leighton Consulting, Inc. should review site grading, foundation, and shoring (if any) plans when available, to comment further on geotechnical aspects of this project and check to see general conformance of final project plans to recommendations presented in this report.

Leighton Consulting, Inc. should be retained to provide geotechnical observation and testing during excavation and all phases of earthwork. Our conclusions and recommendations should be reviewed and verified by us during construction and revised accordingly if geotechnical conditions encountered vary from our findings and interpretations. Geotechnical observation and testing should be provided:

- During all excavation,
- During installation of ground improvements
- During compaction of all fill materials,
- After excavation of all footings and prior to placement of concrete,
- During utility trench backfilling and compaction,
- During pavement subgrade and base preparation, and/or
- If and when any unusual geotechnical conditions are encountered.

5.0 LIMITATIONS

This report was necessarily based in part upon data obtained from a limited number of observances, site visits, soil samples, tests, analyses, histories of occurrences, spaced subsurface explorations and limited information on historical events and observations. Such information is necessarily incomplete. The nature of many sites is such that differing characteristics can be experienced within small distances and under various climatic conditions. Changes in subsurface conditions can and do occur over time. This exploration was performed with the understanding that this subject site is proposed for development as described in Section 1.2 of this report. Please also refer to Appendix E, *GBA's Important Information About This Geotechnical-Engineering Report*, presenting additional information and limitations regarding geotechnical engineering studies and reports.

Until reviewed and accepted by the reviewing government agency, this report may be subject to change. Changes may be required as part of the review process. Leighton Consulting, Inc. assumes no risk or liability for consequential damages that may arise due to design work progressing before this report is reviewed and accepted.

This report was prepared for PBK Architects based on their needs, directions and requirements at the time of our exploration, in accordance with generally accepted geotechnical engineering practices at this time in Orange County for public sites. This report is not authorized for use by, and is not to be relied upon by, any party except PBK Architects and their design and construction management team, with whom Leighton Consulting, Inc. has contracted for this work. Use of or reliance on this report by any other party is at that party's risk. Unauthorized use of or reliance on this report constitutes an agreement to defend and indemnify Leighton Consulting, Inc. from and against any liability which may arise as a result of such use or reliance, regardless of any fault, negligence, and/or strict liability of Leighton Consulting, Inc.

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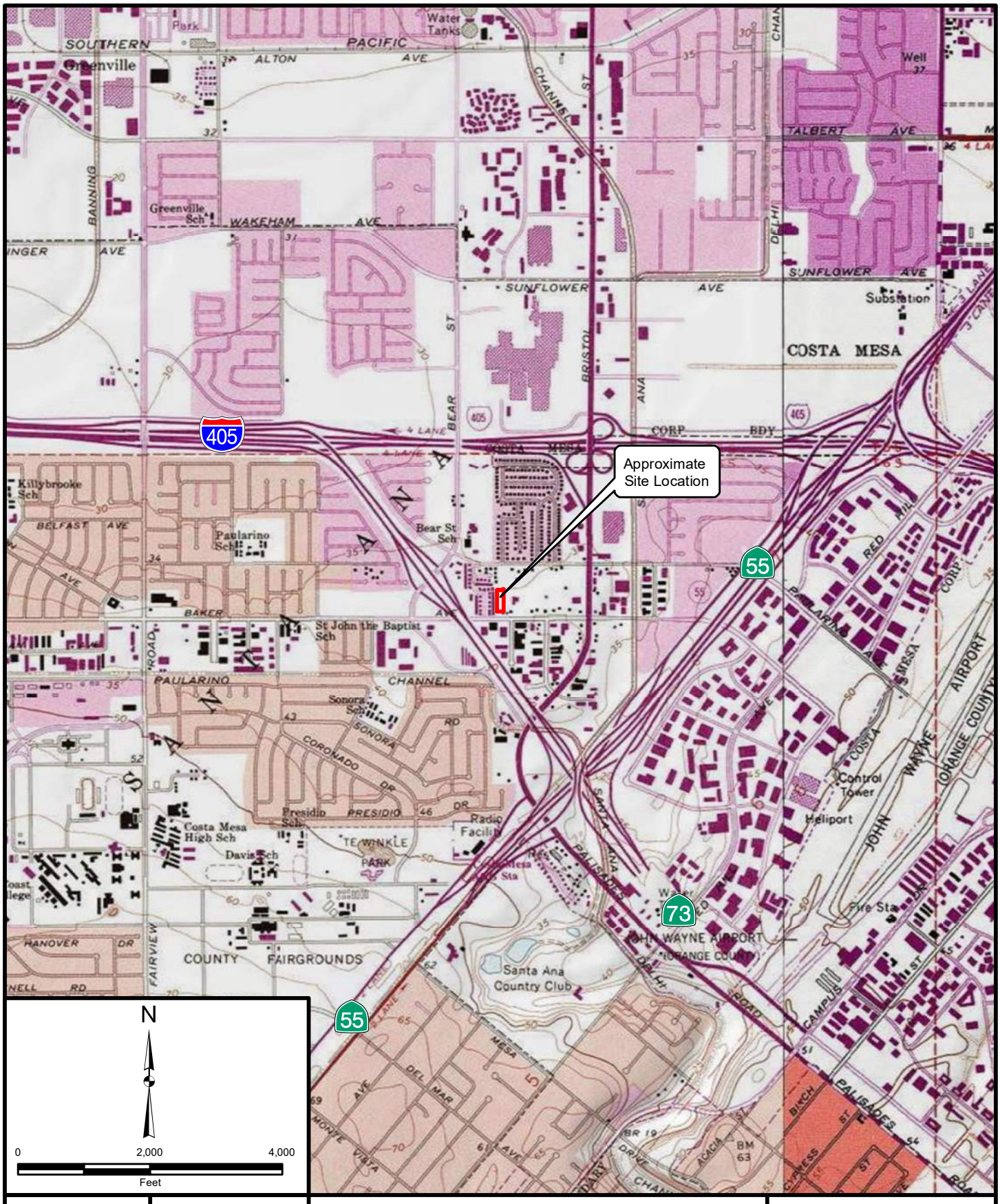
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Project: 24475	Eng/Geol: JT
Scale: 1 " = 2,000 '	Date: July 2024

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SITE LOCATION MAP

Proposed Costa Mesa Fire Station
No. 2 Replacement
800 Baker Street, Costa Mesa, California

FIGURE 1

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Legend

LB-4/IT-2 T.D. 10' No GW — Approximate location of hollow-stem auger boring showing total depth (T.D.), groundwater condition, and depth to earth units and depth to groundwater (GW) in feet below existing ground surface

Approximate Building Footprint

Approximate Site Boundary

Project: 24475	Eng/Geol: JT
Scale: 1 " = 50 '	Date: July 2024

Reference: © 2024 Microsoft Corporation © 2024 Maxar ©CNES (2024) Distribution Airbus DS © 2024 TomTom, Rexford Industrial Realty, Conceptual Sie Plan

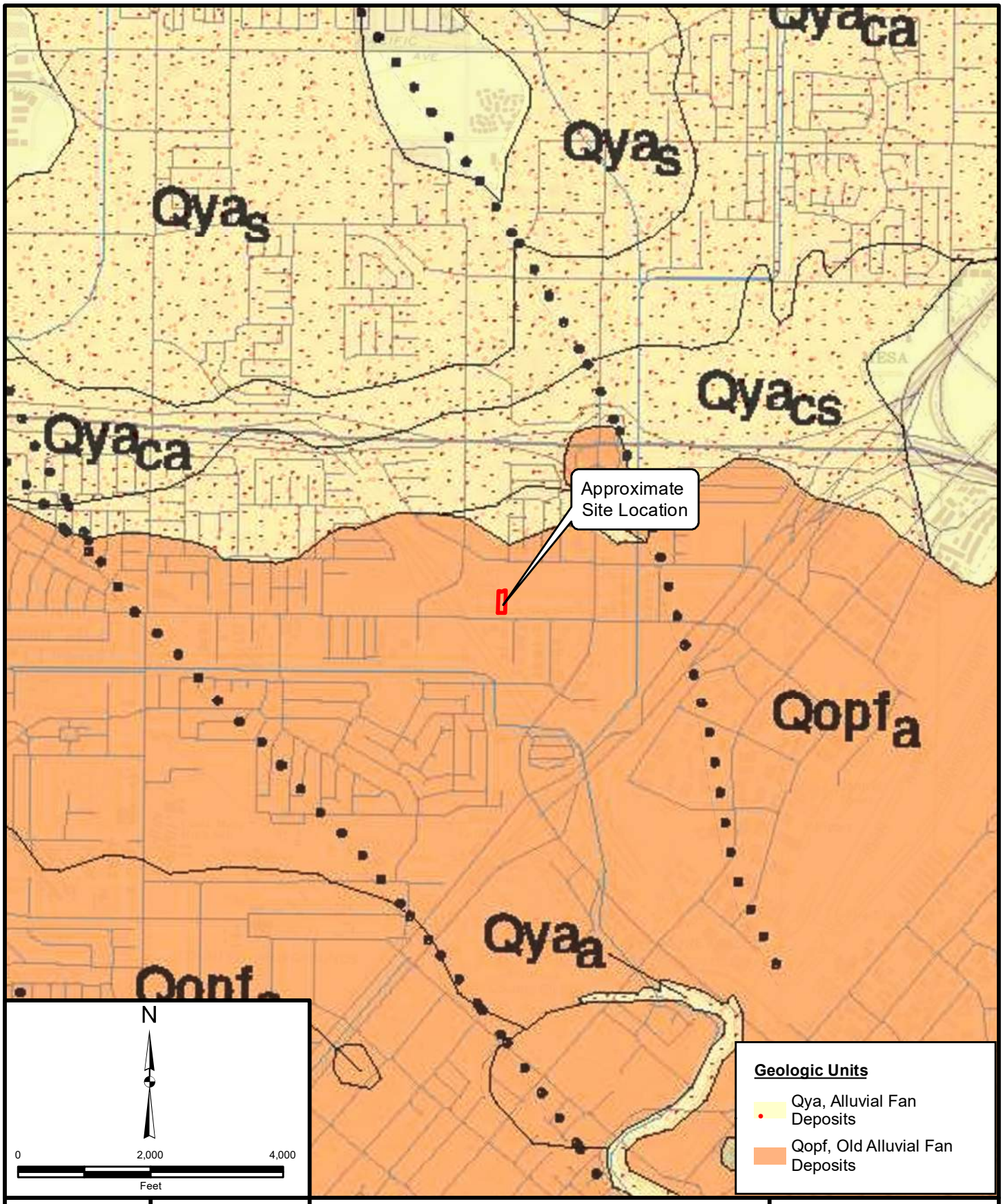
EXPLORATION MAP

Proposed Costa Mesa Fire Station
No. 2 Replacement
800 Baker Street, Costa Mesa, California

FIGURE 2

Leighton

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Project: 24475	Eng/Geol: JT
Scale: 1 " = 2,000 '	Date: July 2024

Reference: Geologic Map of the Santa Ana and San Bernardino Quads (30'x60') by Morton & Miller, 2006.

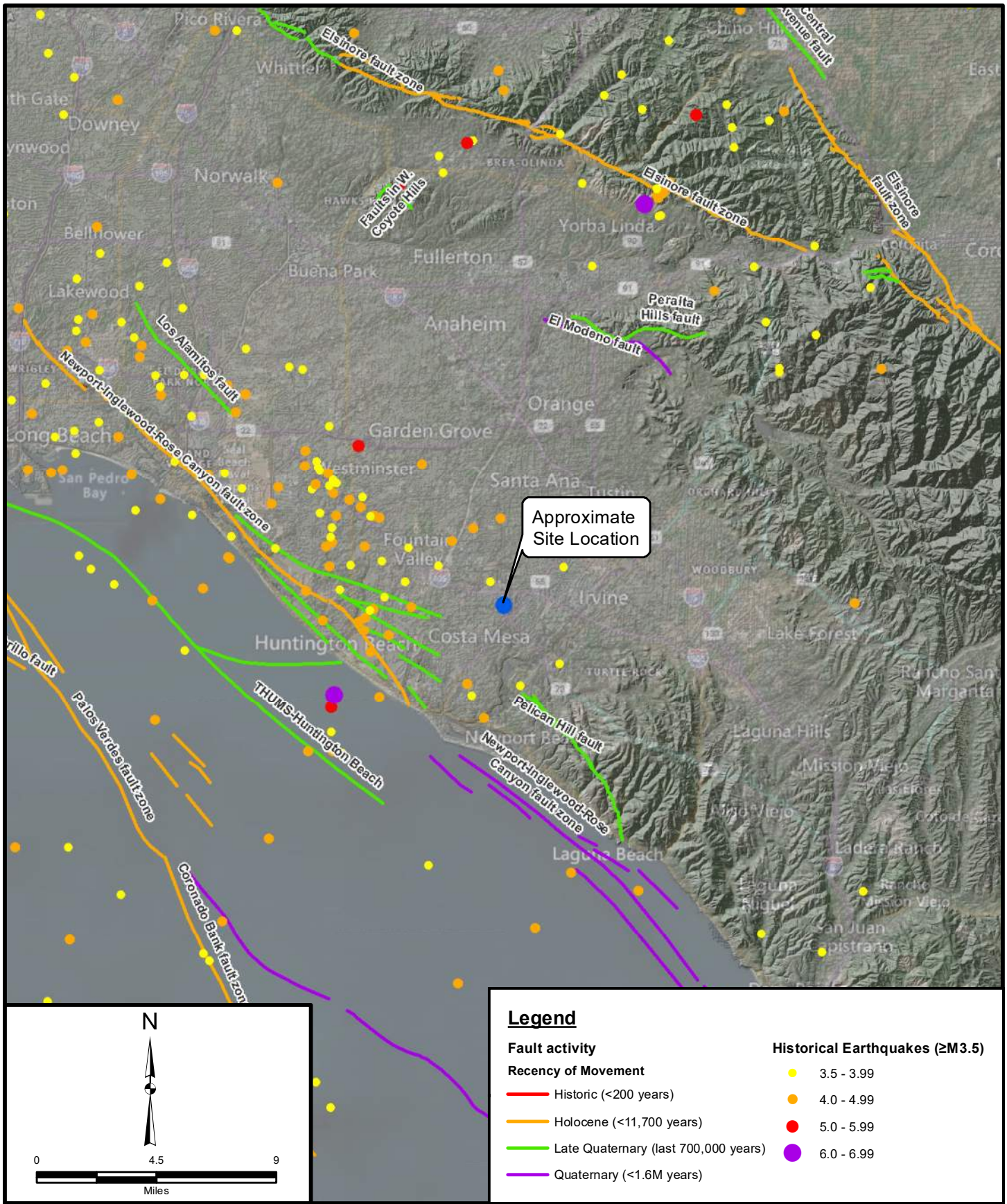
REGIONAL GEOLOGY MAP

Proposed Costa Mesa Fire Station
No. 2 Replacement
800 Baker Street, Costa Mesa, California

FIGURE 3

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Map Saved as Z:\Project Files\OA-PZ\PBKArch\24475 - PBK Costa Mesa FS No. 2 Replacement GE\GIS\24475_F03_RGM_2024-06-18.mxd on 7/8/2024 9:41:55 PM Author: KVM (kmanchikanti)



Project: 24475	Eng/Geol: JT
Scale: 1 " = 5 miles	Date: July 2024

Basemap Reference: © 2024 Microsoft Corporation Earthstar Geographics SIO © 2024 TomTom
Seismicity Data Reference: maps.conservation.ca.gov

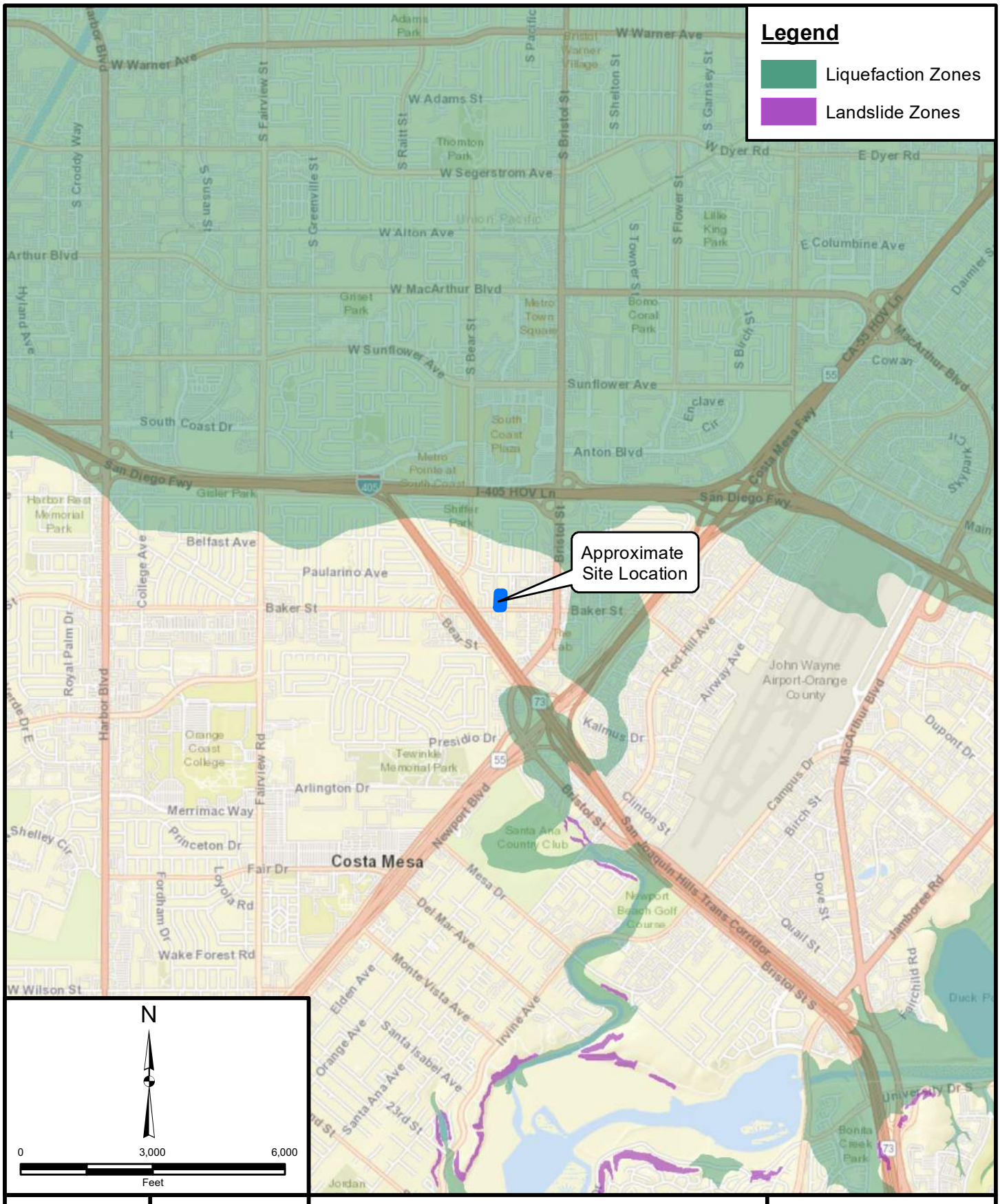
REGIONAL FAULT AND HISTORIC SEISMICITIY MAP

Proposed Costa Mesa Fire Station
No. 2 Replacement
800 Baker Street, Costa Mesa, California

FIGURE 4

Leighton

Map Saved as Z:\Project Files\OA-PZ\PBKArch\24475 - PBK Costa Mesa FS No. 2 Replacement GE\GIS\24475_F04_RFHSM_2024-06-18.mxd on 6/24/2024 3:09:22 PM Author: KVM (kmanchikanti)



Project: 24475	Eng/Geol: JT
Scale: 1 " = 3,000 '	Date: July 2024

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Seismic Hazards Program, California Geological Survey, California Department of Conservation

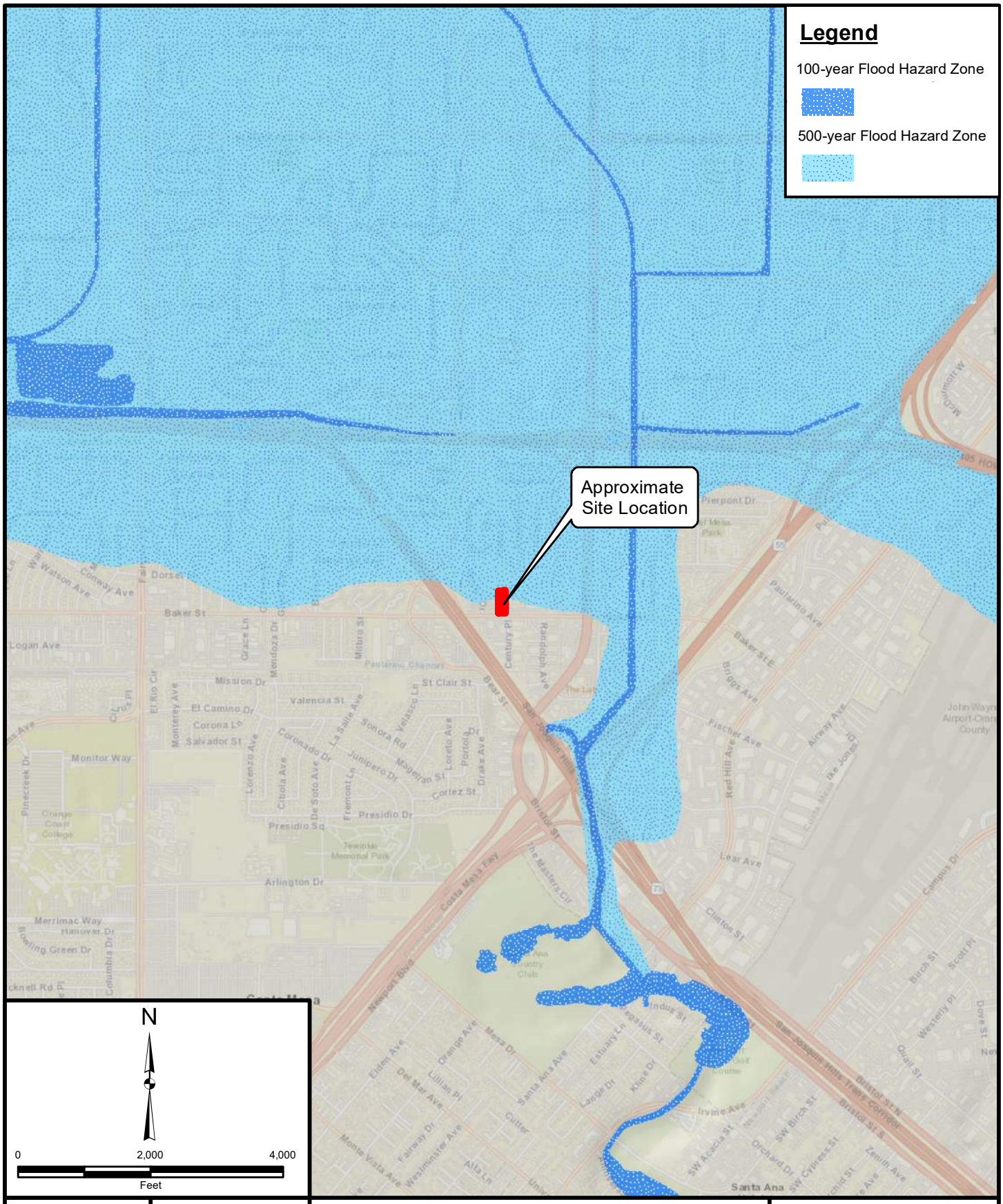
SEISMIC HAZARDS MAP

Proposed Costa Mesa Fire Station
No. 2 Replacement
800 Baker Street, Costa Mesa, California

FIGURE 5

Leighton

Map Saved as Z:\Project Files\OA-PZ\PBKArch\24475 - PBK Costa Mesa FS No. 2 Replacement GE\GIS\24475_F05_SHM_2024-06-18.mxd on 7/8/2024 9:36:00 PM Author: KVM (kmanchikanti)



Project: 24475	Eng/Geol: JT
Scale: 1 " = 2,000 '	Date: July 2024

Reference: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
FEMA (http://www.fema.gov/index.shtm), DWR (http://www.dwr.ca.gov)

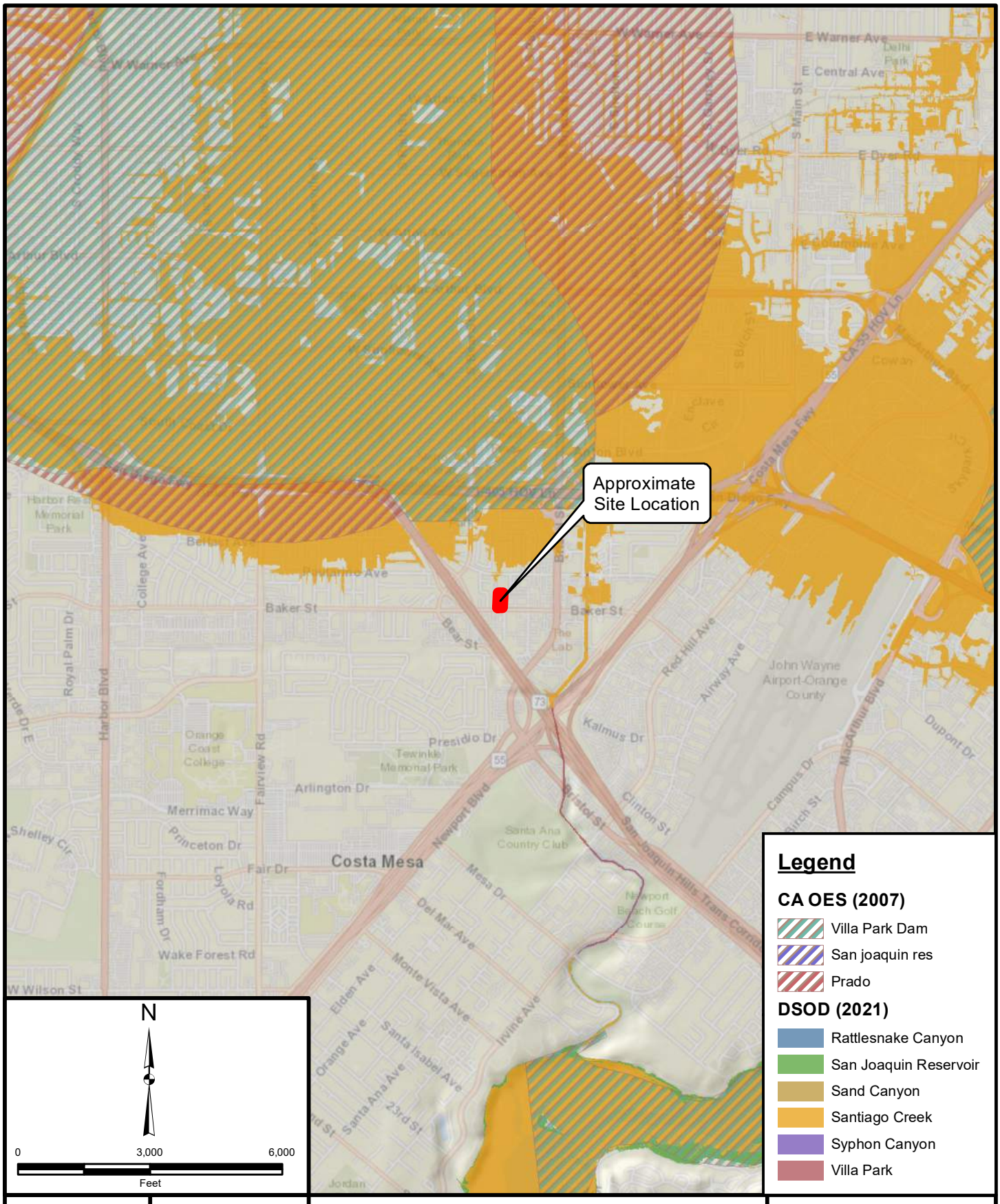
FLOOD HAZARD ZONE MAP

Proposed Costa Mesa Fire Station
No. 2 Replacement
800 Baker Street, Costa Mesa, California

FIGURE 6

Leighton

Map Saved as Z:\Project Files\OA-PZ\PBKArch\24475 - PBK Costa Mesa FS No. 2 Replacement GE\GIS\24475_F06_FHM_2024-06-18.mxd on 7/8/2024 9:30:43 PM Author: KVM (kmanchikanti)



Project: 24475	Eng/Geol: JT
Scale: 1 " = 3,000 '	Date: July 2024

Basemap Reference: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China
Reference: Office of Emergency Services (2007),
Dept of Safety of Dams (2021)
National Inventory of Dams, Army Corps of Engrs (2021)

DAM INUNDATION MAP

Proposed Costa Mesa Fire Station
No. 2 Replacement
800 Baker Street, Costa Mesa, California

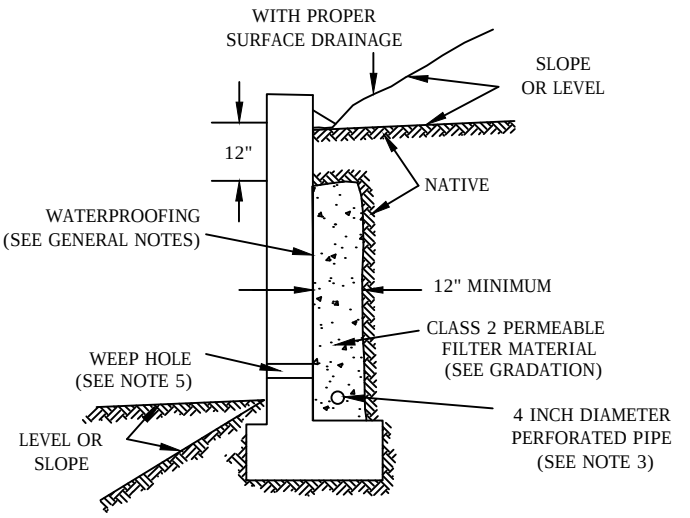
FIGURE 7

Leighton

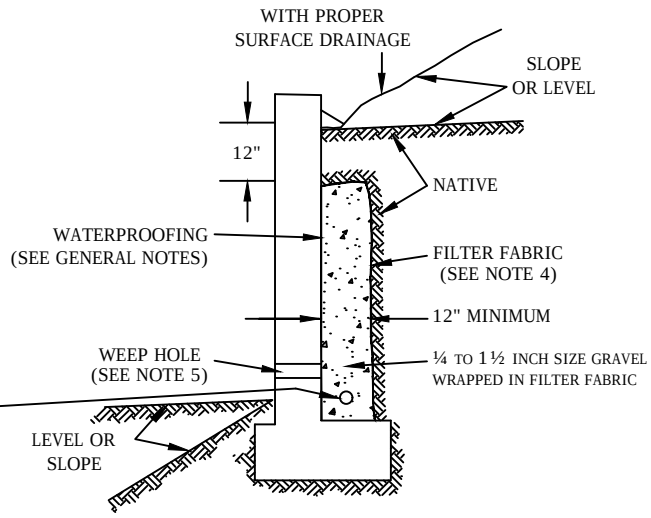
Map Saved as Z:\Project Files\OA-PZ\PBKArch\24475 - PBK Costa Mesa FS No. 2 Replacement GE\GIS\24475_F07_DIM_2024-06-18.mxd on 7/5/2024 11:33:33 AM Author: KVM (kmanchikanti)

SUBDRAIN OPTIONS AND BACKFILL WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50

OPTION 1: PIPE SURROUNDED WITH CLASS 2 PERMEABLE MATERIAL



OPTION 2: GRAVEL WRAPPED IN FILTER FABRIC



Class 2 Filter Permeable Material Gradation
Per Caltrans Specifications

Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

GENERAL NOTES:

* Waterproofing should be provided where moisture nuisance problem through the wall is undesirable.
* Water proofing of the walls is not under purview of the geotechnical engineer
* All drains should have a gradient of 1 percent minimum
*Outlet portion of the subdrain should have a 4-inch diameter solid pipe discharged into a suitable disposal area designed by the project engineer. The subdrain pipe should be accessible for maintenance (rodding)
*Other subdrain backfill options are subject to the review by the geotechnical engineer and modification of design parameters.

Notes:
1) Sand should have a sand equivalent of 30 or greater and may be densified by water jetting.
2) 1 Cu. ft. per ft. of 1/4- to 1 1/2-inch size gravel wrapped in filter fabric
3) Pipe type should be ASTM D1527 Acrylonitrile Butadiene Styrene (ABS) SDR35 or ASTM D1785 Polyvinyl Chloride plastic (PVC), Schedule 40, Armco A2000 PVC, or approved equivalent. Pipe should be installed with perforations down. Perforations should be 3/8 inch in diameter placed at the ends of a 120-degree arc in two rows at 3-inch on center (staggered)
4) Filter fabric should be Mirafi 140NC or approved equivalent.
5) Weephole should be 3-inch minimum diameter and provided at 10-foot maximum intervals. If exposure is permitted, weepholes should be located 12 inches above finished grade. If exposure is not permitted such as for a wall adjacent to a sidewalk/curb, a pipe under the sidewalk to be discharged through the curb face or equivalent should be provided. For a basement-type wall, a proper subdrain outlet system should be provided.
6) Retaining wall plans should be reviewed and approved by the geotechnical engineer.
7) Walls over six feet in height are subject to a special review by the geotechnical engineer and modifications to the above requirements.

RETAINING WALL BACKFILL AND SUBDRAIN DETAIL FOR WALLS 6 FEET OR LESS IN HEIGHT

WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50

Leighton

Figure 8

V:\DRAFTING\TEMPLATES\STANDARD-FIGURES\WALL-STANDARD-FIGURES.DWG 03-02-21 9:07:35AM) Plotted by brian

APPENDIX A

FIELD EXPLORATION

Our field exploration consisted of geologic reconnaissance and a subsurface exploration program consisting of four (4) geotechnical borings. These subsurface exploration locations are plotted on Figure 2, *Exploration Location Map*, and describe in more detail below:

Hollow Stem Auger Borings: On June 17, 2024, four (4) borings were drilled with a truck-mounted drill rig, logged and sampled to depths ranging from approximately 10 feet to 51.5 feet bgs. After sampling and logging, all borings were immediately backfilled with soil cuttings generated during drilling and asphalt cold patched. Encountered soils were continuously logged in the field by our representative and described in accordance with the Unified Soil Classification System (ASTM D 2488). Near surface bulk soil samples were collected from these borings. Boring logs are included as part of this appendix.

Subsurface Variations and Limitations: These attached subsurface exploration logs and related information depict subsurface conditions only at the approximate locations indicated and at the particular date designated on the logs. Subsurface conditions at other locations may differ from conditions occurring at these locations. Passage of time may result in altered subsurface conditions due to possible environmental changes. In addition, any stratification lines depicted on these logs represent an approximate boundary between soil types, but these transitions can be gradual.

GEOTECHNICAL BORING LOG LB-1

Project No.	038.0000024475	**Date Drilled**	6-17-24
Project	PBK Costa Mesa FS No. 2 Replacement GE	**Logged By**	BTM
Drilling Co.	2R Drilling, Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	39'
Location	See Figure 2 - *Exploration Location Map*	**Sampled By**	BTM

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
39	0								**Artificial Fill, undocumented (Afu)**	
									@Surface: 5-inches asphalt concrete over 5-inches base	
				B-1				CL	@10": SANDY CLAY, reddish brown, moist, mostly fine sand, few medium sand, 60-70% fines (filed estimate), low plasticity	SA, MD, EI
				R-1	12 16 24	122	12	CL	@2.5': SANDY CLAY, very stiff, reddish brown, moist, fine sand, some medium sand, 60-70% fines (filed estimate), low to medium plasticity, trace asphalt chunks	
35	5			R-2	9 16 25	121	13	CL	@5': SANDY CLAY, very stiff, reddish brown, moist, fine sand, some medium sand, 55-65% fines (field estimate), low to medium plasticity	
				R-3	12 11 12	119	10	CL-SC	**Old Alluvial Fan Deposit (Qopf)** @7.5': SANDY CLAY to CLAYEY SAND, very stiff to medium dense, reddish brown, moist, fine sand, 45-60% fines (field estimate), low plasticity	CO
30	10			R-4	7 9 20	103	17	SM	@10': SILTY SAND, medium dense, yellowish brown, slightly moist, fine sand, 25-35% fines (field estimate), low plasticity, grading slightly coarser toward bottom, 10-20% fines (field estimate)	
				R-5	10 16 23			ML	@12.5': SANDY SILT, very stiff, gray brown, slightly moist, very fine sand, 70-80% fines (field estimate), low plasticity	
25	15			R-6	9 16 22			ML	@15': SANDY SILT, very stiff, gray brown, slightly moist, very fine sand, 50-60% fines (field estimate), low plasticity	
20	20			S-7	5 7 9			ML	@20': SANDY SILT with CLAY, very stiff, grayish brown, moist, fine sand, 55-65% fines (field estimate), low plasticity	
15	25			R-8	19 24 22			ML-SM	@25': SANDY SILT to SILTY SAND, hard to dense, gray brown, moist to very moist, very fine sand, 45-60% fines (field estimate), low plasticity	
10	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

Leighton

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG LB-1

Project No.	038.0000024475	**Date Drilled**	6-17-24
Project	PBK Costa Mesa FS No. 2 Replacement GE	**Logged By**	BTM
Drilling Co.	2R Drilling, Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	39'
Location	See Figure 2 - *Exploration Location Map*	**Sampled By**	BTM

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			S-9	4 5 6		24	CL	@30': LEAN CLAY with SAND, stiff, gray and orange, very moist to saturated, 79% fines (lab), low to medium plasticity, oxidation staining	-200, AL
5	35			R-10	9 15 22			ML	@35': SANDY SILT, very stiff, light gray, very moist, very fine sand, 70-80% fines (field estimate), low plasticity	
0	40			S-11	9 27 31			SP-SM	@40': POORLY-GRADED SAND with SILT, very dense, yellowish brown, very moist to saturated, mostly fine sand, few medium to coarse sand, few fines, nonplastic	
-5	45			R-12	50/6"			SP-SM	@45': POORLY-GRADED SAND with SILT, very dense, yellowish brown, very moist to saturated, mostly fine sand, some medium to coarse sand, few fines, nonplastic	
-10	50			S-13	5 7 10		27	SP-SM CL	@50': POORLY-GRADED SAND with SILT, very dense, yellowish brown, very moist to saturated, mostly fine sand, some medium to coarse sand, few fines, nonplastic @51': LEAN CLAY, very stiff, dark gray, very moist, very fine sand, 90% fines (lab), low plasticity, slightly micaceous	-200, AL
-15	55								**Total Depth: 51.5 feet bgs** **Groundwater encountered at 31 feet bgs, rose to 25 feet after ~10 minutes** **Boring backfilled with soil cuttings and patched at surface with cold-mix asphalt.**	
-20	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-2

Project No.	038.0000024475	**Date Drilled**	6-17-24
Project	PBK Costa Mesa FS No. 2 Replacement GE	**Logged By**	BTM
Drilling Co.	2R Drilling, Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	38'
Location	See Figure 2 - *Exploration Location Map*	**Sampled By**	BTM

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
	0								**Artificial Fill, undocumented (Afu)**	
				B-1				CL	@Surface: 5.5-inches asphalt concrete over 4-inches base @9.5": SANDY CLAY, reddish brown, moist, fine sand, 55-65% fines (field estimate), low plasticity	RV, CR
35				R-1	8 15 22	120	14	CL	@2.5': SANDY CLAY, very stiff, brown, mottled with lighter brown, slightly moist, fine sand, 65-75% fines (field estimate), low to medium plasticity	
	5			R-2	10 20 32			CL	**Old Alluvial Fan Deposit (Qopf)** @5': SANDY CLAY, hard, reddish brown, slightly moist, fine sand, few medium sand, 65-75% fines (field estimate), low plasticity, slightly micaceous	
30				R-3	7 10 16	103	21	ML	@7.5': SANDY SILT, very stiff, white to light gray, slightly moist, very fine sand, few medium to coarse sand, 60-75% fines (field estimate), low plasticity; grading to SILTY SAND, light brown, slightly moist, fine sand, 20-30% fines (field estimate)	
	10			R-4	9 11 11			SM	@10': SILTY SAND, medium dense, light brown, slightly moist, fine sand, 20-30% fines (field estimate), low plasticity, slightly micaceous; grading to SANDY SILT with CLAY, stiff, gray, slightly moist, fine sand, 60-70% fines (field estimate), low plasticity, slight oxidation	
25				R-5	11 15 20	105	24	ML	@12.5': SANDY SILT with CLAY, very stiff, gray, slightly moist, fine sand, 60-70% fines (field estimate), low plasticity, oxidation staining	
	15			S-6	5 10 12			ML	@15': SANDY SILT with CLAY, very stiff, gray, slightly moist, fine sand, 50-60% fines (field estimate), low plasticity, oxidation staining	
20										
	20			R-7	10 20 30			ML-SM	@20': SILTY SAND to SANDY SILT, dense to hard, grayish brown, slightly moist, fine sand, 40-60% fines (field estimate), low plasticity, slightly micaceous	
15										
	25			S-8	4 8 12			ML-SM	@25': SILTY SAND to SANDY SILT, medium dense to very stiff, light brown, moist, fine sand, 40-60% fines (field estimate), low plasticity, slightly micaceous	
10										
	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

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GEOTECHNICAL BORING LOG LB-2

Project No.	038.0000024475	**Date Drilled**	6-17-24
Project	PBK Costa Mesa FS No. 2 Replacement GE	**Logged By**	BTM
Drilling Co.	2R Drilling, Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	38'
Location	See Figure 2 - *Exploration Location Map*	**Sampled By**	BTM

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			R-9	10 14 15			CL	@30': SANDY CLAY, very stiff, brown, very moist to saturated, fine sand, 60-75% fines (field estimate), low to medium plasticity	
5									**Total Depth: 31.5 feet bgs** **Groundwater encountered at 27 feet bgs, rose to 24 feet after ~10 minutes** **Boring backfilled with soil cuttings and patched at surface with cold-mix asphalt.**	
	35									
0										
	40									
-5										
	45									
-10										
	50									
-15										
	55									
-20										
	60									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-3 / IT-1

Project No.	038.0000024475	**Date Drilled**	6-17-24
Project	PBK Costa Mesa FS No. 2 Replacement GE	**Logged By**	BTM
Drilling Co.	2R Drilling, Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	38'
Location	See Figure 2 - *Exploration Location Map*	**Sampled By**	BTM

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
38	0								**Artificial Fill, undocumented (Afu)** @Surface: 5 inches asphalt over 9 inches of old asphalt and base mixture	
35	5			B-1				CL	@1.17': SANDY CLAY, reddish brown, moist, fine sand, 65-75% fines (field estimate), medium plasticity	
				S-1	7 10 11			SC	**Old Alluvial Fan Deposit (Qopf)** @5': CLAYEY SAND, very stiff, reddish brown, moist, fine sand, few medium sand, 35-45% fines (field estimate), low plasticity, micaceous	
30	10			S-2	5 5 6			SM CL-ML	@10': SILTY SAND, medium dense, light brown, slightly moist, very fine to fine sand, 20-30% fines (field estimate), low plasticity, micaceous @11': Grades quickly to SANDY SILTY CLAY, stiff, light brown to grayish brown, slightly moist, very fine to fine sand, 70% fines (lab), low plasticity, micaceous	-200
25	15			S-3	5 8 10			CL	@13.5': SANDY LEAN CLAY, very stiff, light brown, moist, very fine sand, 61% fines (lab), low plasticity, little oxidation staining	-200
20	20								**Total Depth: 15 feet bgs** **No groundwater encountered during drilling** **Temporary percolation well installed; screened from 10 to 15 feet bgs** **Upon completion of infiltration testing, boring backfilled with soil cuttings to surface and patched at surface with cold-mix asphalt.**	
15	25									
10	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-4 / IT-2

Project No.	038.0000024475	**Date Drilled**	6-17-24
Project	PBK Costa Mesa FS No. 2 Replacement GE	**Logged By**	BTM
Drilling Co.	2R Drilling, Inc.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	37'
Location	See Figure 2 - *Exploration Location Map*	**Sampled By**	BTM

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
35	0								**Artificial Fill, undocumented (Afu)** @Surface: 5-inches asphalt concrete over 5-inches base	
								CL	@10": SANDY CLAY, reddish brown, moist, fine sand, few medium sand, 60-70% fines (field estimate), medium plasticity	
30	5			S-1	6 7 8			SC-SM	**Old Alluvial Fan Deposit (Qopf)** @5': SILTY CLAYEY SAND, medium dense, reddish brown, moist, fine to medium sand, 48% fines (lab), low plasticity, micaceous	-200
				S-2	8 11 14			SP-SM	@8.5': POORLY-GRADED SAND with SILT, medium dense, brown to reddish brown, moist, fine to medium sand, trace coarse sand, 6% fines (lab), low plasticity, slightly micaceous	-200
25	10								**Total Depth: 10 feet bgs** **No groundwater encountered during drilling** **Temporary percolation well installed; screened from 5 to 10 feet bgs** **Upon completion of infiltration testing, boring backfilled with soil cuttings to surface and patched at surface with cold-mix asphalt.**	
15	15									
20	20									
15	25									
10	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

Leighton

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

Results of Falling Head Infiltration Test

Project:	22475
Exploration #/Location:	*IT-1*
Depth Boring drilled to (ft):	15
Tested by:	BTM
USCS Soil Type in test zone:	CL-ML
Weather (start to finish):	Sunny
Water Source/pH:	H2O
Measured boring diameter:	8 in.
Approx Depth to GW BGS:	100 ft (GW or aquatarde)
Well Prep:	Drill to 15', bottom 5' slotted 2" PVC well pipe with sand around the anulus.

4 in. Well Radius

Initial estimated Depth to Water Surface (in.): 129
Average depth of water in well, "h" (in.): 48
approx. h/r: 11.9
Tu (Fig. 8) (ft): 89.3
Tu>3h?: yes, OK

Cross-sectional area for vol calcs (in.^2): 17.3

	ft	in.	Total (in.)
Depth to Bot of well measured from top of p	15.2 ft	0. in.	182
Pilot Tube stickup (+ is above ground)	0. ft	6. in.	6
Depth to top of sand outside of casing from top of pil	9. ft	0. in.	

Use of Barrels: No
Use of Flow Meter: No
Use of DH Valve: No
Test Type: Falling Head

Field Data **Calculations**

Date	Time	Depth to WL in Boring (measured from top of pilot tube)		Water Temp (deg F)	Refilled? (or Comments)	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3)			Flow (in^3/ min)	q, Flow (in^3/ hr)	V (Fig 9)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date	Start time:	ft	in.									from supply	from Δh	Total				
6/18/24	8:05																	
6/18/24	8:34	11.42					29	131.0	51.4									
6/18/24	8:39	11.5				5	34	132.0	50.4	-0.96	51	0	17	17	3	199	0.9	0.14
6/18/24	8:44	11.54				5	39	132.5	49.9	-0.48	50	0	8	8	2	100	0.9	0.07
6/18/24	8:49	11.58				5	44	133.0	49.4	-0.48	50	0	8	8	2	100	0.9	0.07
6/18/24	8:54	11.62				5	49	133.4	49.0	-0.48	49	0	8	8	2	100	0.9	0.07
6/18/24	8:59	11.65				5	54	133.8	48.6	-0.36	49	0	6	6	1	75	0.9	0.05
6/18/24	9:09	11.69				10	64	134.3	48.1	-0.48	48	0	8	8	1	50	0.9	0.04
6/18/24	9:19	11.71				10	74	134.5	47.9	-0.24	48	0	4	4	0	25	0.9	0.02
6/18/24	9:29	11.74				10	84	134.9	47.5	-0.36	48	0	6	6	1	37	0.9	0.03
6/18/24	9:39	11.76				10	94	135.1	47.3	-0.24	47	0	4	4	0	25	0.9	0.02
6/18/24	9:49	11.78				10	104	135.4	47.0	-0.24	47	0	4	4	0	25	0.9	0.02
6/18/24	9:59	11.8				10	114	135.6	46.8	-0.24	47	0	4	4	0	25	0.9	0.02
6/18/24	10:14	11.83				15	129	136.0	46.4	-0.36	47	0	6	6	0	25	0.9	0.02
6/18/24	10:29	11.87				15	144	136.4	46.0	-0.48	46	0	8	8	1	33	0.9	0.03
6/18/24	10:44	11.91				15	159	136.9	45.5	-0.48	46	0	8	8	1	33	0.9	0.03
6/18/24	10:59	11.95				15	174	137.4	45.0	-0.48	45	0	8	8	1	33	0.9	0.03
6/18/24	11:14	12				15	189	138.0	44.4	-0.6	45	0	10	10	1	42	0.9	0.03
																Minimum Rate:		0.02
										Raw Rate for design, prior to application of adjustment factors:								**0.30**

Results of Well Permeameter, from USBR 7300-89 Method

Project:	22475
Exploration #/Location:	*IT-2*
Depth Boring drilled to (ft):	10
Tested by:	BTM
USCS Soil Type in test zone:	SC-SM
Weather (start to finish):	Sunny
Water Source/pH:	H2O
Measured boring diameter:	8 in.
Approx Depth to GW BGS:	100 ft (GW or aquatarde)
Well Prep:	Drill to 10', bottom 5' slotted 2" PVC well pipe with sand around the anulus.

4 in. Well Radius

Initial estimated Depth to Water Surface (in.):	83
Average depth of water in well, "h" (in.):	38
approx. h/r:	9.4
Tu (Fig. 8) (ft):	93.1
Tu>3h?:	yes, OK
Cross-sectional area for vol calcs (in.^2):	17.3

	ft	in.	Total (in.)
Depth to Bot of well measured from top of pilot tube	10.3 ft	0. in.	124
Pilot Tube stickup (+ is above ground)	0. ft	3. in.	3
Depth to top of sand outside of casing from top of pilot tube	4. ft	0. in.	

Use of Barrels:	No
Use of Flow Meter:	Yes
Use of DH Valve:	No
Test Type:	Constant Head

Flow Meter:

Meter ID	SN20002497
Meter Color	Black
Meter Units	
DL ID	

Field Data | **Calculations**

Date	Time	Data from Flow Meter		Depth to WL in Boring (measured from top of pilot tube)		Water Temp (deg F)	Refilled?	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3)			Flow (in^3/ min)	q, Flow (in^3/ hr)	V (Fig 9)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
		Reading (cu-ft or gal)	Interval Pulse Count				(or Comments)							from supply	from Δh	Total				
Start Date	Start time:	0		ft	in.															
6/18/24	8:05																			
6/18/24	8:51	6761.79		7.8					46	90.6	33.0									
6/18/24	8:56	6767.3		7.69				5	51	89.3	34.3	1.32	34	1273	-23	1250	250	15000	0.9	15.43
6/18/24	9:01	6782.85		7.62				5	56	88.4	35.2	0.84	35	3592	-15	3578	716	42930	0.9	42.86
6/18/24	9:11	6803.45		7.53				10	66	87.4	36.2	1.08	36	4759	-19	4740	474	28440	0.9	27.67
6/18/24	9:16	6814.2		7.51				5	71	87.1	36.5	0.24	36	2483	-4	2479	496	29749	0.9	28.45
6/18/24	9:21	6824.72		7.5				5	76	87.0	36.6	0.12	37	2430	-2	2428	486	29137	0.9	27.73
6/18/24	9:26	6835.45		7.46				5	81	86.5	37.1	0.48	37	2479	-8	2470	494	29644	0.9	28.00
6/18/24	9:31	6846.15		7.46				5	86	86.5	37.1	0	37	2472	0	2472	494	29660	0.9	27.84
6/18/24	9:41	6868.08		7.38				10	96	85.6	38.0	0.96	38	5066	-17	5049	505	30295	0.9	28.09
6/18/24	9:51	6890.3		7.35				10	106	85.2	38.4	0.36	38	5133	-6	5127	513	30760	0.9	28.05
6/18/24	10:01	6912.8		7.34				10	116	85.1	38.5	0.12	38	5198	-2	5195	520	31173	0.9	28.26
6/18/24	10:16	6946.45		7.32				15	131	84.8	38.8	0.24	39	7773	-4	7769	518	31076	0.9	28.05
6/18/24	10:31	6979.9		7.25				15	146	84.0	39.6	0.84	39	7727	-15	7712	514	30850	0.9	27.48
6/18/24	10:46	7014.15		7.22				15	161	83.6	40.0	0.36	40	7912	-6	7906	527	31622	0.9	27.76
6/18/24	11:01	7047.82		7.18				15	176	83.2	40.4	0.48	40	7778	-8	7769	518	31078	0.9	27.01
6/18/24	11:16	7081.85		7.15				15	191	82.8	40.8	0.36	41	7861	-6	7855	524	31419	0.9	27.04
																		Minimum Rate:		15.43
												Raw Rate for design, prior to application of adjustment factors:								**27.00**

APPENDIX B

GEOTECHNICAL LABORATORY TESTING

Our geotechnical laboratory testing program was directed toward a quantitative and qualitative evaluation of physical and mechanical properties of soils underlying proposed improvements, and to aid in verifying soil classification.

In-Situ Moisture and Density: As-sampled soil moisture content was measured (ASTM D 2216) on selected samples recovered from our borings. In addition, in place dry density was measured (ASTM D 2937) on selected relatively undisturbed soil samples. Results of these tests are shown on our logs at the appropriate sample depths in Appendix A.

Percent Passing No. 200 Sieve: Percent fines (silt and clay) passing the No. 200 U.S. Standard Sieve was determined for soil samples in accordance with ASTM D 1140 Standard Test Method. Samples were dried and passed through a No. 4 sieve, then a No. 200 sieve. Result of this grain size analysis, as percent by dry weight passing the No. 200 U.S. Standard Sieve, is tabulated in this appendix and entered on our boring logs.

Modified Proctor Compaction Curve: A laboratory modified Proctor compaction curve (ASTM D1557) was established for bulk soil-sample to evaluate the modified Proctor laboratory maximum dry density and optimum moisture content. Results of this test are presented on the following *Modified Proctor Compaction Test* sheet in this appendix.

Corrosivity Tests: To evaluate corrosion potential of subsurface soils at the site, we tested a bulk soil sample collected during our subsurface exploration for pH, electrical resistivity (CTM 532/643), soluble sulfate content (CTM 417 Part II) and soluble chloride content (CTM 422) testing. Results of these tests are enclosed at the end of this appendix.

Expansion Index (EI): An Expansion Index (EI) test was performed on a representative shallow bulk soil sample from this site, in general accordance with the ASTM D4829 Standard Test Method.

Atterberg Limits (AL): Liquid Limit (LL), Plastic Limit (PL) and Plasticity Index (PI) were determined for soil samples in accordance with ASTM D4318 Standard Test Method. Soil

samples were air-dried and passed through a No. 40 sieve, then re-moisturized. Liquid Limit and Plastic Limit tests were performed on fraction of soil samples passing the No. 40 sieve. Results of these tests are presented on the "*Atterberg Limits*" sheet in this appendix.

Swell or Collapse of Soils (CO): Swell or collapse of soil tests were performed on relatively-undisturbed ring-lined drive-sampler soil samples, to measure the magnitude of one-dimensional wetting-induced swell or collapse on unsaturated soils. Results are presented in this appendix on the *One-Dimensional Swell or Collapse of Soils* (ASTM D 4546) sheets.

Resistance Value (R-Value): R-Value for a shallow bulk soil sample was established by California Test Method 301 to assist in preliminary pavement design recommendations. R-Value results are presented in this appendix on the *R-Value Test Results* sheets.

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	PBK Costa Mesa FS No. 2 Replacement	Tested By:	M. Saba	Date:	07/02/24
Project No.:	038.0000024475	Checked By:	A. Santos	Date:	07/05/24
Boring No.:	LB-1	Depth (ft.):	2-5		
Sample No.:	B-1				
Soil Identification:	Yellowish brown sandy lean clay s(CL)				

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03320 *Ram Weight = 10 lb.; Drop = 18 in.*

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3731	3905	3909			
Weight of Mold (g)	1780	1780	1780			
Net Weight of Soil (g)	1951	2125	2129			
Wet Weight of Soil + Cont. (g)	864.3	959.3	928.2			
Dry Weight of Soil + Cont. (g)	832.6	900.8	852.3			
Weight of Container (g)	75.6	76.5	79.2			
Moisture Content (%)	4.19	7.10	9.82			
Wet Density (pcf)	129.6	141.1	141.4			
Dry Density (pcf)	124.3	131.8	128.7			

Maximum Dry Density (pcf) **131.9** **Optimum Moisture Content (%)** **7.6**

PROCEDURE USED

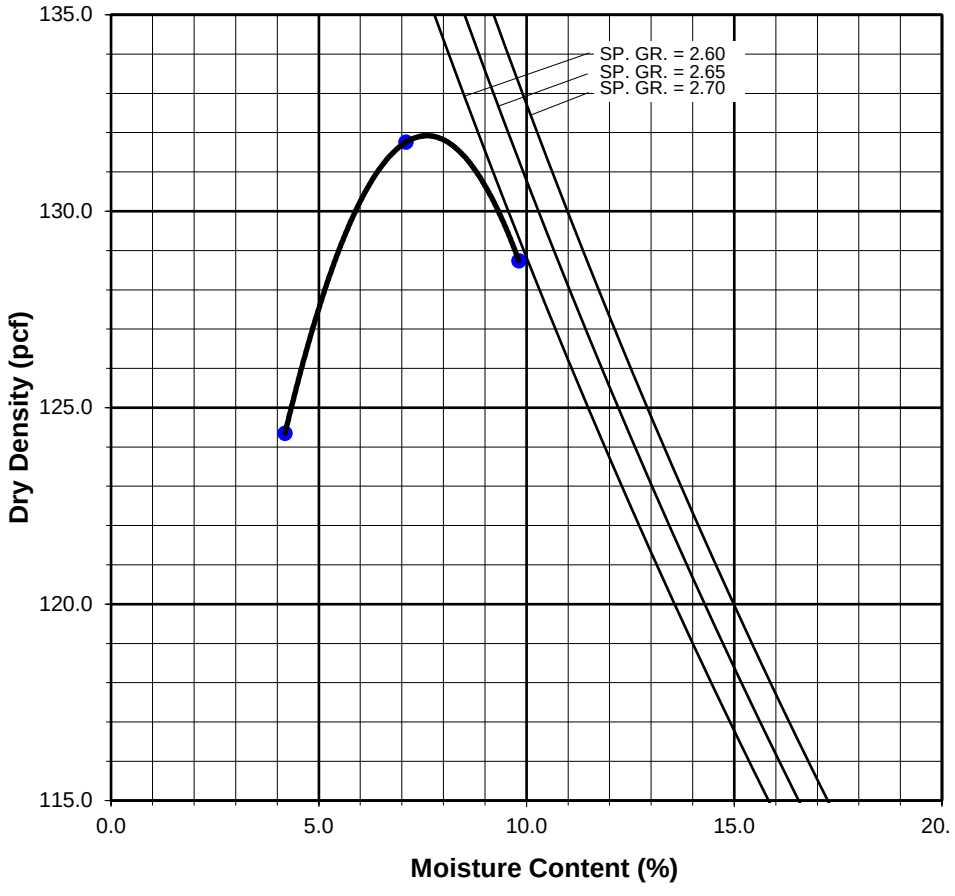
[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:
1:46:53
GR:SA:FI

Atterberg Limits:
LL,PL,PI



PARTICLE-SIZE DISTRIBUTION (GRADATION) of SOILS USING SIEVE ANALYSIS

ASTM D6913

Project Name: PBK Costa Mesa FS No. 2 Replacement
Project No.: 038.0000024475
Boring No.: LB-1
Sample No.: B-1
Soil Identification: Yellowish brown sandy lean clay s(CL)

Tested By: G. Bathala Date: 06/26/24
Checked By: J. Ward Date: 07/09/24
Depth (feet): 2-5

Calculation of Dry Weights	Whole Sample	Sample Passing #4	Moisture Contents	Whole Sample	Sample passing #4
Container No.:	CP-15	WR	Wt. of Air-Dry Soil + Cont.(g)	0.0	0.0
Wt. Air-Dried Soil + Cont.(g)	2406.8	721.9	Wt. of Dry Soil + Cont. (g)	0.0	0.0
Wt. of Container (g)	223.1	236.6	Wt. of Container No._____(g)	1.0	1.0
Dry Wt. of Soil (g)	2183.7	485.3	Moisture Content (%)	0.0	0.0

Passing #4 Material After Wet Sieve		
	Container No.	WR
	Wt. of Dry Soil + Container (g)	472.0
	Wt. of Container (g)	236.6
	Dry Wt. of Soil Retained on # 200 Sieve (g)	235.4

U. S. Sieve Size		Cumulative Weight of Dry Soil Retained (g)		Percent Passing (%)
	(mm.)	Whole Sample	Sample Passing #4	
3"	75.0			
1 1/2"	37.5			
1"	25.0			
3/4"	19.0			
1/2"	12.5	0.0		100.0
3/8"	9.5	6.6		99.7
#4	4.75	15.4		99.3
#8	2.36		3.0	98.7
#16	1.18		11.3	97.0
#30	0.600		34.4	92.3
#50	0.300		80.0	82.9
#100	0.150		147.6	69.1
#200	0.075		227.0	52.9
PAN				

GRAVEL: **1 %**
SAND: **46 %**
FINES: **53 %**
GROUP SYMBOL: **s(CL)**

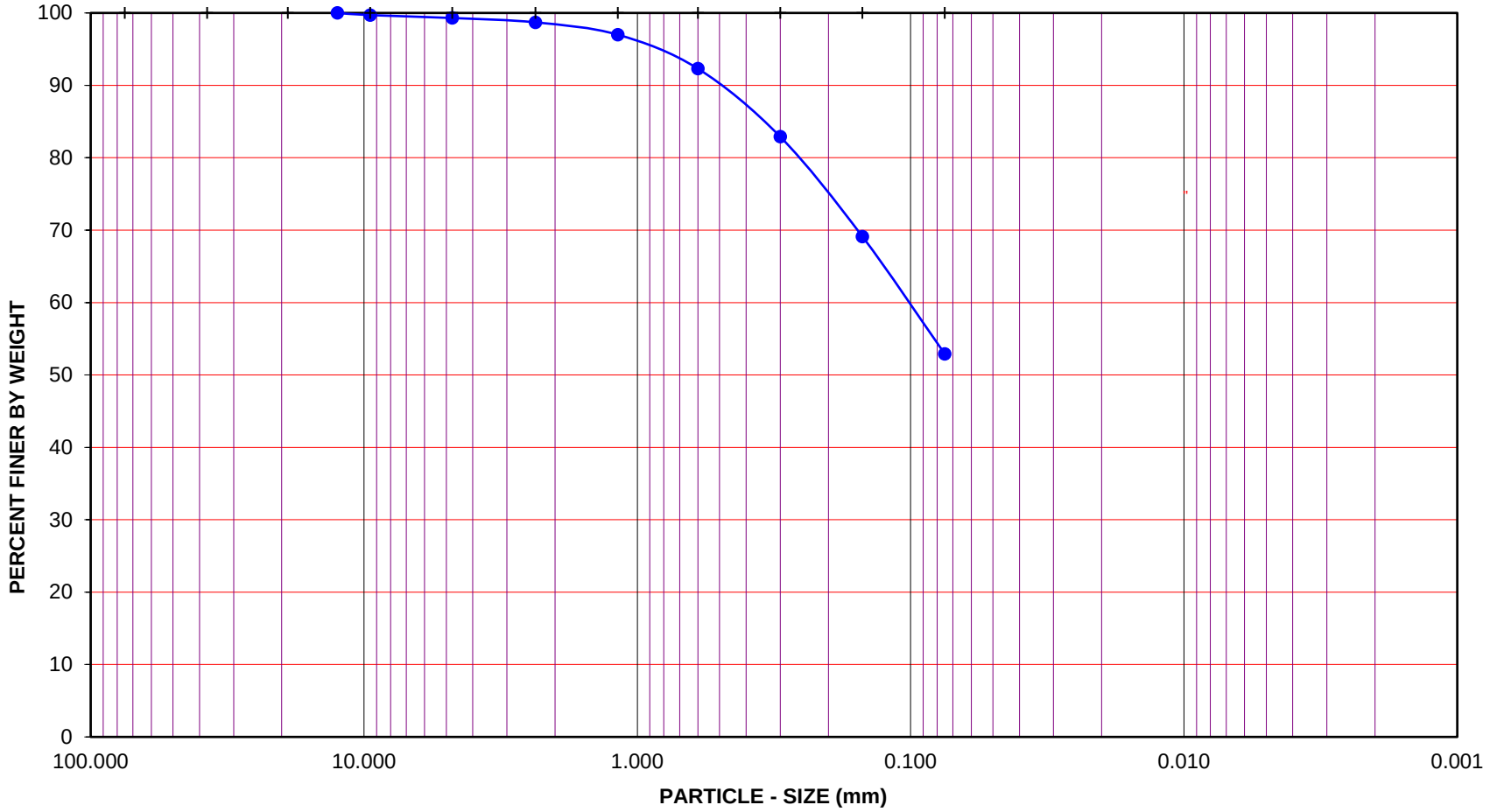
Cu = D60/D10 = _____
Cc = $(D30)^2/(D60*D10)$ = _____

Remarks: _____

GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

U.S. STANDARD SIEVE OPENING | U.S. STANDARD SIEVE NUMBER | HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: PBK Costa Mesa FS No. 2 Replacement

Project No.: 038.0000024475

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PARTICLE - SIZE DISTRIBUTION ASTM D 6913

Boring No.: LB-1 Sample No.: B-1

Depth (feet): 2-5 Soil Type : s(CL)

Soil Identification: Yellowish brown sandy lean clay s(CL)

GR:SA:FI : (%) 1 : 46 : 53

Jul-24

Sieve LB-1, B-1 @ 2-5

Boring No.	LB-1	LB-1	LB-3/IT-1	LB-3/IT-1	LB-4/IT-2	LB-4/IT-2		
Sample No.	S-9	S-13B	S-2B	S-3	S-1	S-2		
Depth (ft.)	30.0	51.0	11.0	13.5	5.0	8.5		
Sample Type	SPT	SPT	SPT	SPT	SPT	SPT		
Soil Identification	Light olive brown lean clay with sand (CL)s	Olive gray lean clay (CL)	Olive gray sandy silty clay s(CL-ML), caliche noted	Olive gray sandy lean clay s(CL)	Yellowish brown silty, clayey sand (SC-SM)	Yellowish brown poorly-graded sand with silt (SP-SM)		
Moisture Correction								
Wet Weight of Soil + Container (g)	0.00	0.00	0.00	0.00	0.00	0.00		
Dry Weight of Soil + Container (g)	0.00	0.00	0.00	0.00	0.00	0.00		
Weight of Container (g)	1.00	1.00	1.00	1.00	1.00	1.00		
Moisture Content (%)	0.00	0.00	0.00	0.00	0.00	0.00		
Sample Dry Weight Determination								
Weight of Sample + Container (g)	418.47	424.61	351.20	427.67	423.20	657.39		
Weight of Container (g)	77.06	82.49	75.46	74.50	87.76	76.67		
Weight of Dry Sample (g)	341.41	342.12	275.74	353.17	335.44	580.72		
Container No.:								
After Wash								
Method (A or B)	B	B	B	B	B	A		
Dry Weight of Sample + Cont. (g)	148.34	116.45	157.74	213.80	262.40	621.02		
Weight of Container (g)	77.06	82.49	75.46	74.50	87.76	76.67		
Dry Weight of Sample (g)	71.28	33.96	82.28	139.30	174.64	544.35		
% Passing No. 200 Sieve	**79.1**	**90.1**	**70.2**	**60.6**	**47.9**	**6.3**		
% Retained No. 200 Sieve	20.9	9.9	29.8	39.4	52.1	93.7		

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PERCENT PASSING
No. 200 SIEVE
ASTM D 1140

Project Name: PBK Costa Mesa FS No. 2 Replacement

Project No.: 038.0000024475

Tested By: G. Bathala Date: 06/28/24

EXPANSION INDEX of SOILS
ASTM D 4829

Project Name:	PBK Costa Mesa FS No. 2 Replacement	Tested By:	G. Berdy	Date:	06/27/24
Project No.:	038.0000024475	Checked By:	J. Ward	Date:	07/09/24
Boring No.:	LB-1	Depth (ft.):	2-5		
Sample No.:	B-1				
Soil Identification:	Yellowish brown sandy lean clay s(CL)				

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN		Before Test	After Test
Specimen Diameter	(in.)	4.01	4.01
Specimen Height	(in.)	1.0000	1.0080
Wt. Comp. Soil + Mold	(g)	621.20	456.52
Wt. of Mold	(g)	190.00	0.00
Specific Gravity (Assumed)		2.70	2.70
Container No.		O	O
Wet Wt. of Soil + Cont.	(g)	730.00	646.52
Dry Wt. of Soil + Cont.	(g)	679.10	591.13
Wt. of Container	(g)	0.00	190.00
Moisture Content	(%)	7.50	13.81
Wet Density	(pcf)	130.1	136.6
Dry Density	(pcf)	121.0	120.0
Void Ratio		0.393	0.404
Total Porosity		0.282	0.288
Pore Volume	(cc)	58.4	60.1
Degree of Saturation (%) [S_{meas}]		**51.5**	92.2

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
06/27/24	12:24	1.0	0	0.5315
06/27/24	12:34	1.0	10	0.5310
Add Distilled Water to the Specimen				
06/27/24	13:32	1.0	58	0.5365
06/28/24	6:08	1.0	1054	0.5395
06/28/24	9:29	1.0	1255	0.5395

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**8**

ATTERBERG LIMITS
ASTM D 4318

Project Name:	PBK Costa Mesa FS No. 2 Replacement	Tested By:	J. Domingo	Date:	07/02/24
Project No. :	038.0000024475	Input By:	G. Bathala	Date:	07/05/24
Boring No.:	LB-1	Checked By:	J. Ward		
Sample No.:	S-9	Depth (ft.)	30.0		
Soil Identification:	Light olive brown lean clay with sand (CL)s				

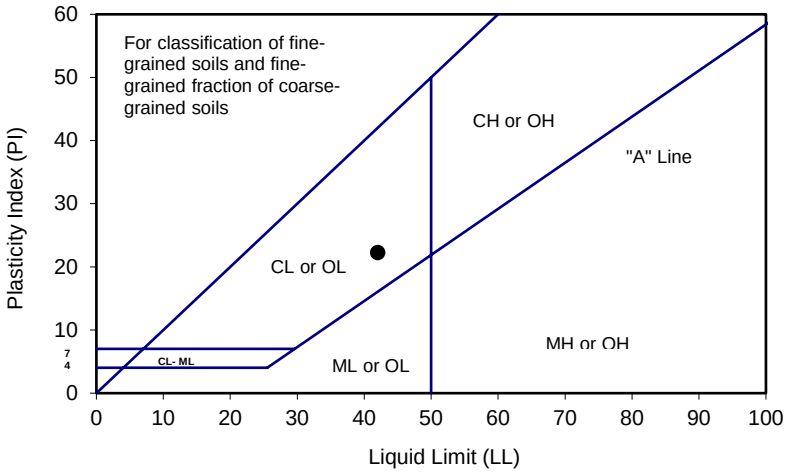
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			32	24	15	
Wet Wt. of Soil + Cont. (g)	9.83	9.91	20.39	19.65	20.88	
Dry Wt. of Soil + Cont. (g)	8.39	8.45	14.82	14.09	14.71	
Wt. of Container (g)	1.10	1.06	1.10	1.07	1.13	
Moisture Content (%) [Wn]	19.75	19.76	40.60	42.70	45.43	

Liquid Limit	**42**
Plastic Limit	**20**
Plasticity Index	**22**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 16.06

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.12}$



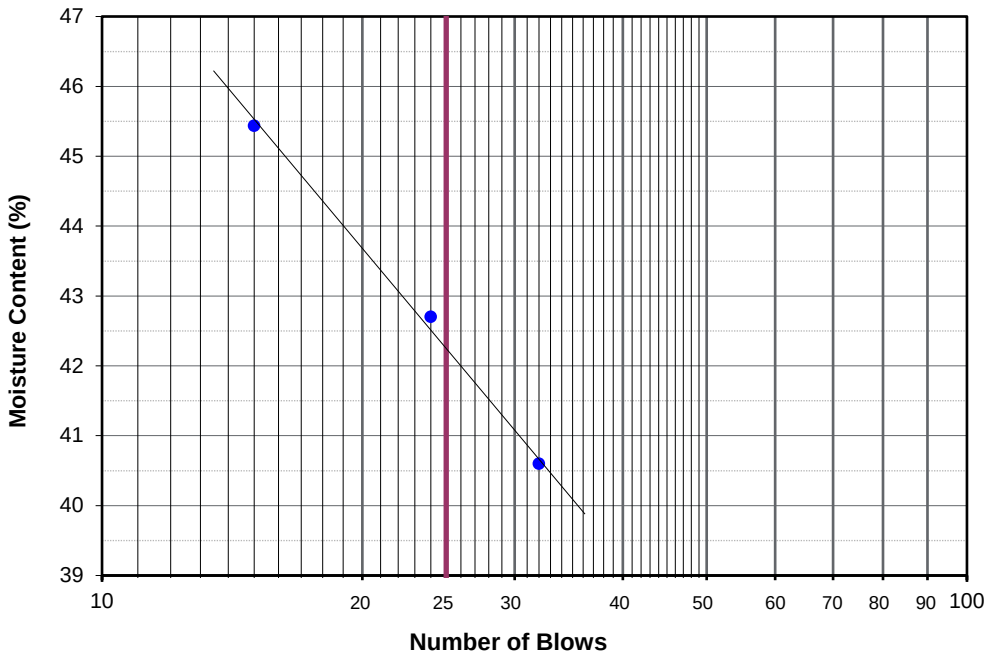
PROCEDURES USED

☐ Wet Preparation
Multipoint - Wet

☒ Dry Preparation
Multipoint - Dry

☒ Procedure A
Multipoint Test

☐ Procedure B
One-point Test



ATTERBERG LIMITS
ASTM D 4318

Project Name:	PBK Costa Mesa FS No. 2 Replacement	Tested By:	J. Domingo	Date:	07/06/24
Project No. :	038.0000024475	Input By:	JD/JHW	Date:	07/08/24
Boring No.:	LB-1	Checked By:	J. Ward		
Sample No.:	S-13B	Depth (ft.)	51.0		
Soil Identification:	Olive gray lean clay (CL)				

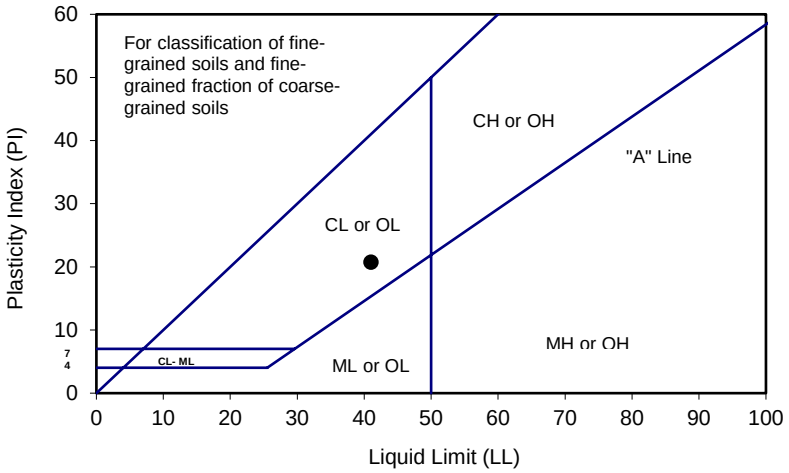
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			31	25	17	
Wet Wt. of Soil + Cont. (g)	9.40	9.38	21.45	21.84	21.50	
Dry Wt. of Soil + Cont. (g)	8.00	7.98	15.64	15.79	15.31	
Wt. of Container (g)	1.06	1.08	1.08	1.11	1.08	
Moisture Content (%) [Wn]	20.17	20.29	39.90	41.21	43.50	

Liquid Limit	**41**
Plastic Limit	**20**
Plasticity Index	**21**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 15.33

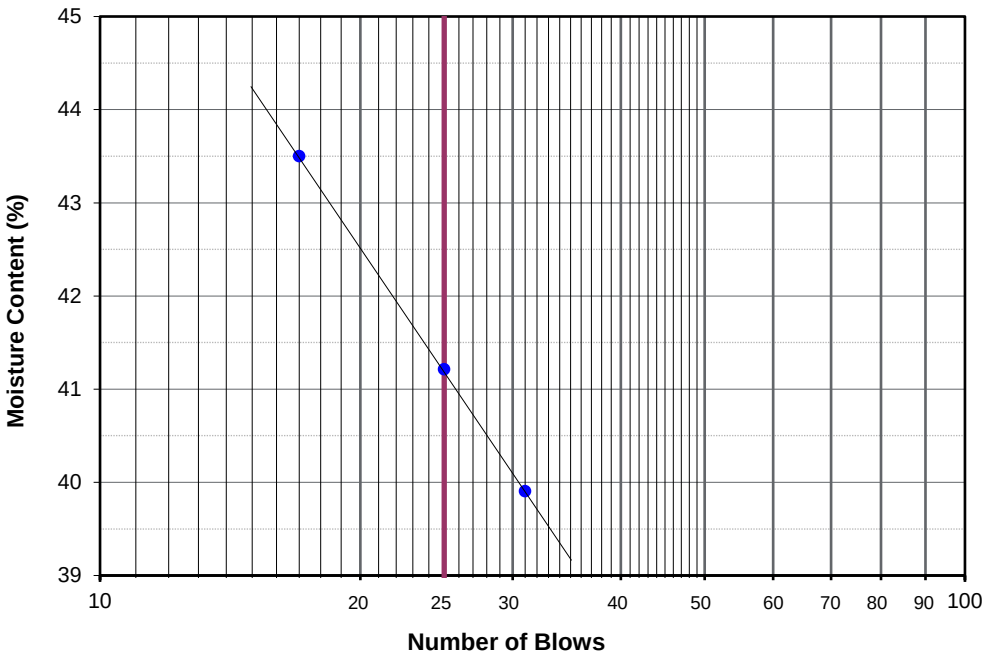
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.12}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS

ASTM D 4546

Project Name:	PBK Costa Mesa FS No. 2 Replacement	Tested By:	G. Bathala	Date:	06/26/24
Project No.:	038.0000024475	Checked By:	J. Ward	Date:	07/09/24
Boring No.:	LB-1	Sample Type:	Ring		
Sample No.:	R-3	Depth (ft.)	7.5		
Sample Description:	Yellowish brown lean clay (CL)				

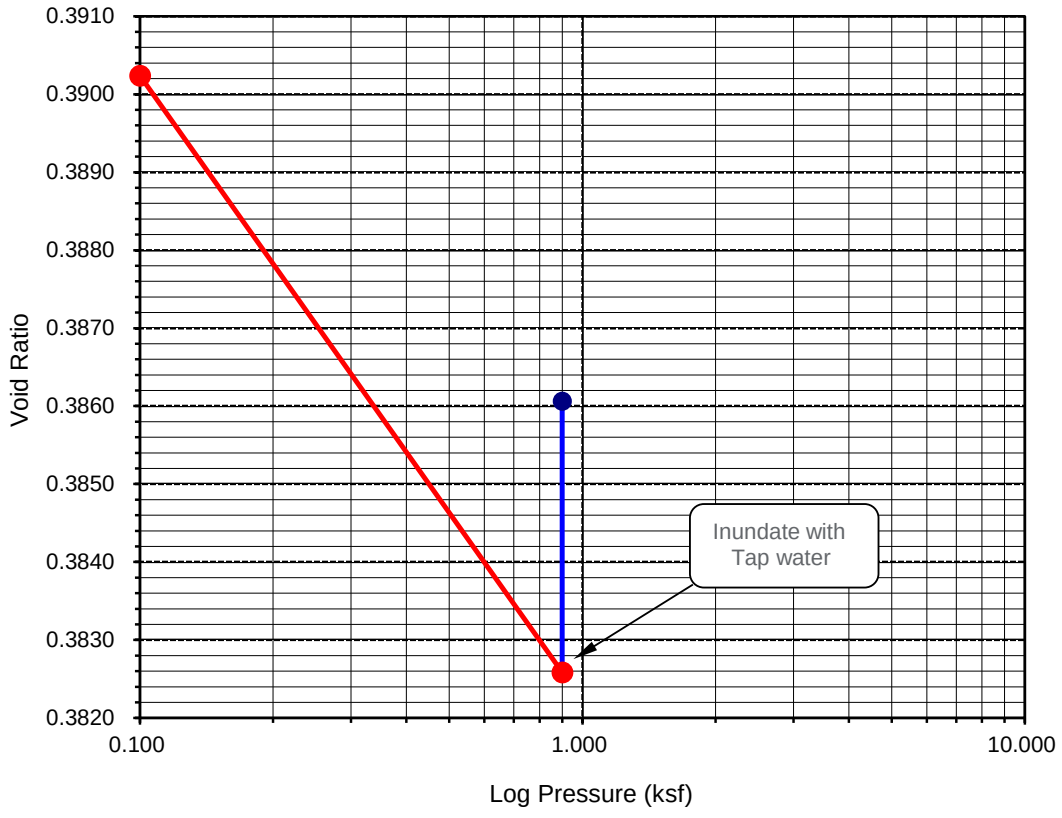
Initial Dry Density (pcf):	121.1
Initial Moisture (%):	10.30
Initial Length (in.):	1.0000
Initial Dial Reading:	0.0276
Diameter(in):	2.415

Final Dry Density (pcf):	121.9
Final Moisture (%) :	15.5
Initial Void ratio:	0.3914
Specific Gravity(assumed):	2.70
Initial Saturation (%)	71.0

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.100	0.0284	0.9992	0.00	-0.08	0.3902	-0.08
0.900	0.0352	0.9924	0.13	-0.76	0.3826	-0.63
H2O	0.0327	0.9949	0.13	-0.51	0.3861	-0.38

Percent Swell (+) / Settlement (-) After Inundation = 0.25

Void Ratio - Log Pressure Curve



TESTS for SULFATE CONTENT
CHLORIDE CONTENT and pH of SOILS

Project Name: PBK Costa Mesa FS No. 2 Replacement Tested By : G. Berdy Date: 06/26/24

Project No. : 038.0000024475 Checked By: J. Ward Date: 07/09/24

Boring No.	LB-2			
Sample No.	B-1			
Sample Depth (ft)	0-5			
Soil Identification:	Brown CL			
Wet Weight of Soil + Container (g)	0.00			
Dry Weight of Soil + Container (g)	0.00			
Weight of Container (g)	1.00			
Moisture Content (%)	0.00			
Weight of Soaked Soil (g)	100.74			

SULFATE CONTENT, DOT California Test 417, Part II

Beaker No.	15			
Crucible No.	302/303			
Furnace Temperature (°C)	860			
Time In / Time Out	7:30/8:15			
Duration of Combustion (min)	45			
Wt. of Crucible + Residue (g)	122.9876			
Wt. of Crucible (g)	122.9852			
Wt. of Residue (g) (A)	0.0024			
PPM of Sulfate (A) x 41150	98.76			
PPM of Sulfate, Dry Weight Basis	**99**			

CHLORIDE CONTENT, DOT California Test 422

ml of Extract For Titration (B)	15			
ml of AgNO3 Soln. Used in Titration (C)	0.8			
PPM of Chloride (C -0.2) * 100 * 30 / B	120			
PPM of Chloride, Dry Wt. Basis	**120**			

pH TEST, DOT California Test 643

pH Value	**9.10**			
Temperature °C	21.7			

SOIL RESISTIVITY TEST

DOT CA TEST 643

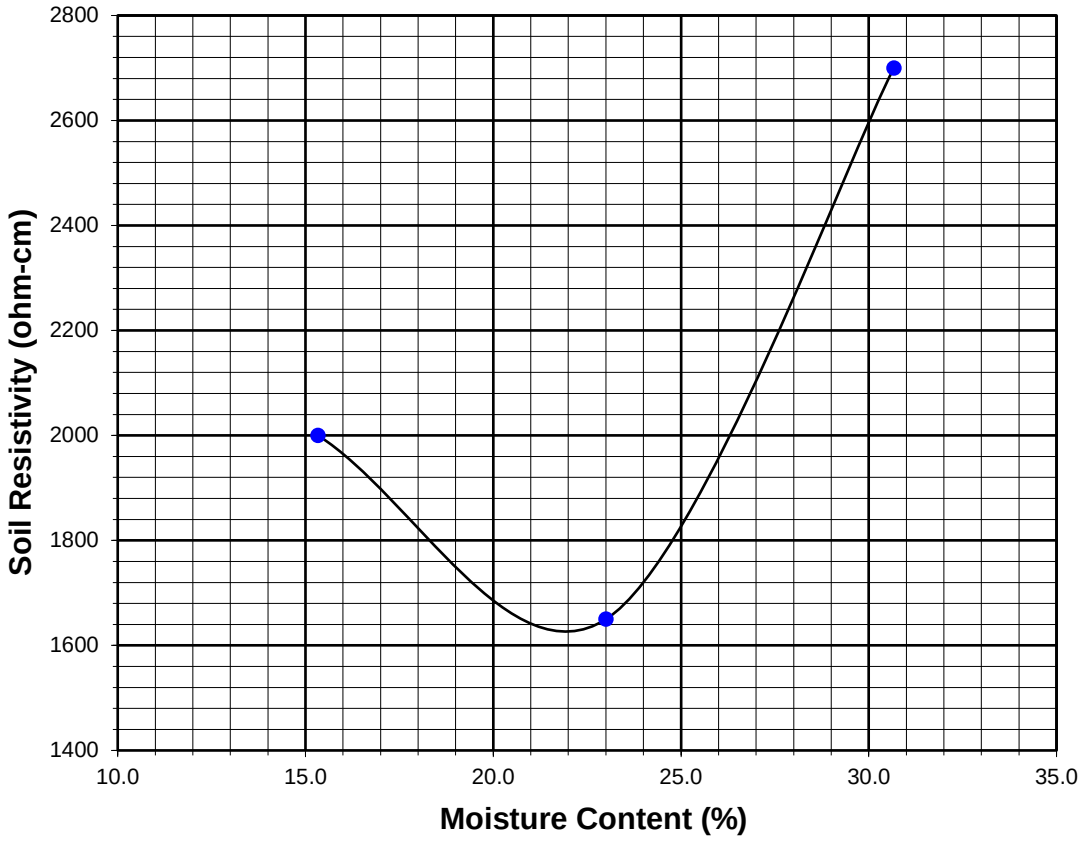
Project Name:	PBK Costa Mesa FS No. 2 Replacement		Tested By :	G. Berdy	Date: 06/27/24
Project No. :	038.0000024475		Checked By:	J. Ward	Date: 07/09/24
Boring No.:	LB-2		Depth (ft.) :	0-5	
Sample No. :	B-1				
Soil Identification:*	Brown CL				

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	20	15.34	2000	2000
2	30	23.00	1650	1650
3	40	30.67	2700	2700
4				
5				

Moisture Content (%) (MCi)	0.00
Wet Wt. of Soil + Cont. (g)	0.00
Dry Wt. of Soil + Cont. (g)	0.00
Wt. of Container (g)	1.00
Container No.	
Initial Soil Wt. (g) (Wt)	130.42
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 643	
1620	**22.0**	**99**	**120**	**9.10**	**21.7**



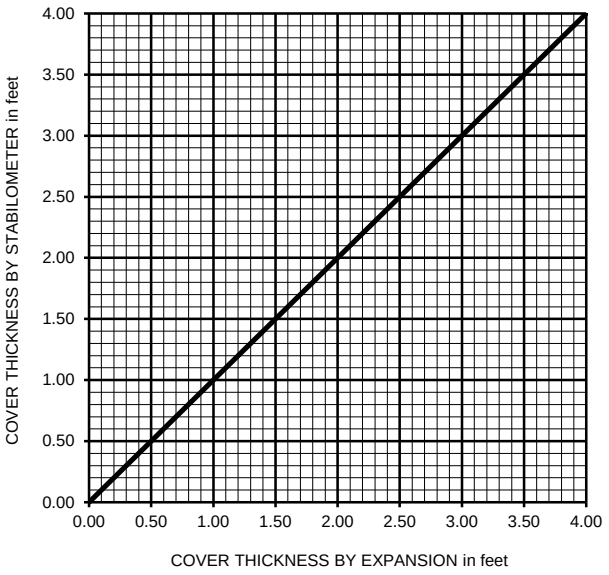
R-VALUE TEST RESULTS
DOT CA Test 301

PROJECT NAME:	PBK Costa Mesa FS No.2 Replacement	PROJECT NUMBER:	038.0000024475
BORING NUMBER:	LB-2	DEPTH (FT.):	0 - 5.0
SAMPLE NUMBER:	B-1	TECHNICIAN:	F. Mina
SAMPLE DESCRIPTION:	Brown lean clay (CL)	DATE COMPLETED:	7/2/2024

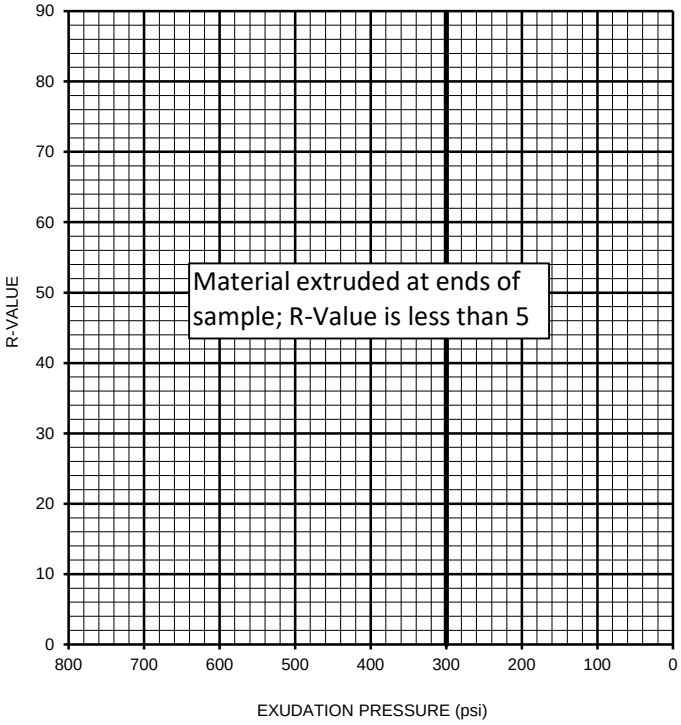
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %			
HEIGHT OF SAMPLE, Inches			
DRY DENSITY, pcf			
COMPACTOR PRESSURE, psi			
EXUDATION PRESSURE, psi			
EXPANSION, Inches x 10exp-4			
STABILITY Ph 2,000 lbs (160 psi)			
TURNS DISPLACEMENT			
R-VALUE UNCORRECTED	N/A	N/A	N/A
R-VALUE CORRECTED	N/A	N/A	N/A

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	N/A	N/A	N/A
EXPANSION PRESSURE THICKNESS, ft.	N/A	N/A	N/A

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	N/A
R-VALUE BY EXUDATION:	N/A
EQUILIBRIUM R-VALUE:	< 5

APPENDIX C

SEISMIC

Determination of Site Class and Estimation of Shear Wave Velocity

Project: 24475 Costa Mesa FS No. 2

Depth (ft)	di, Layer Thick (ft)	Field Blow Counts, Ni Corrected for Cs and sampler type Blows per foot (bpf) LB-1	LB-2		Average Ni (bpf)	Ni Hammer Corr: 1.3	di / Ni
5	7.5	25	31		28	36	0.21
10	5	17	13		15	20	0.26
15	5	23	22		23	29	0.17
20	5	16	30		23	30	0.17
25	5	28	20		24	31	0.16
30	5	11	17		14	18	0.27
35	5	22			22	29	0.17
40	5	58			58	75	0.07
45	5	60			60	78	0.06
50	7.5	17			17	22	0.34
60	10	17	*Assumed based on blowcount at 50'		17	22	0.45
70	10	17			17	22	0.45
80	10	17			17	22	0.45
90	10	17			17	22	0.45
100	5	17			17	22	0.23
Summatio	100						3.92
						Navg = Sum(di) / Sum(di / Ni) =	**26**

Extract of ASCE 7-16 Table 20.3-1 Site Classification (2019 CBC 1613A.2.2):

Site Class	Soil Profile Name	Avg. N upper 100' from	to	Vs30 (ft/sec) from	to	Vs30 (m/s) from	to	Site Avg N	Interpolated vs30 (ft/s)
A	Hard Rock	-		5000	10000	1524	3048		
B	Rock	-		2500	5000	762	1524		
C	VD soil & soft rock	50.001	100	1200	2500	366	762		
D	Stiff Soil	**15**	**50**	600	1200	183	366	26	781
E	Soft Soil	0	14.999	0	600	0	183		
F		-	-			0	0		

SITE CLASS, Table 20.3-1: D

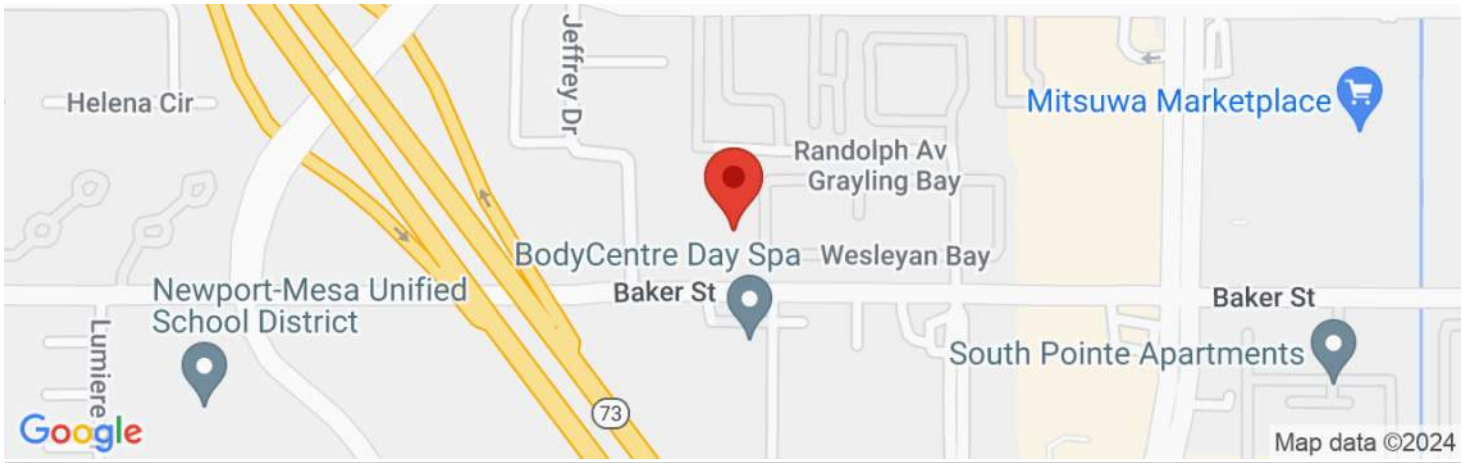
Estimation of Average Shear Wave Velocity in upper 100 ft (Vs30):

	ft/s	m/s
Approx. Vs30 (interpolation of Table 20.3-1) =	781	238
Approx. Vs30 sands (Imai and Tonouchi, 1982) =	968	295
Approx. Vs30 sands (Sykora and Stokoe, 1983) =	839	256
Approx. Vs30 (Maheswari, Boominathan, Dodagoudar, 2009) =	797	243

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.
USGS web services are now operational so this tool should work as expected.

OSHPD

Latitude, Longitude: 33.6806, -117.8899



Date	7/11/2024, 2:23:11 PM
Design Code Reference Document	ASCE7-16
Risk Category	IV
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.301	MCE_R ground motion. (for 0.2 second period)
S_1	0.466	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.301	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.867	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.558	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.614	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.301	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.412	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.159	Factored deterministic acceleration value. (0.2 second)
S1RT	0.466	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.504	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.746	Factored deterministic acceleration value. (1.0 second)
PGAd	0.888	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.558	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.922	Mapped value of the risk coefficient at short periods
C_{R1}	0.925	Mapped value of the risk coefficient at a period of 1 s
C_V	1.36	Vertical coefficient

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U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Please also see the new USGS Earthquake Hazard Toolbox for access to the most recent NSHMs for the conterminous U.S. and Hawaii.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

33.6806

Time Horizon

Return period in years

2475

Longitude

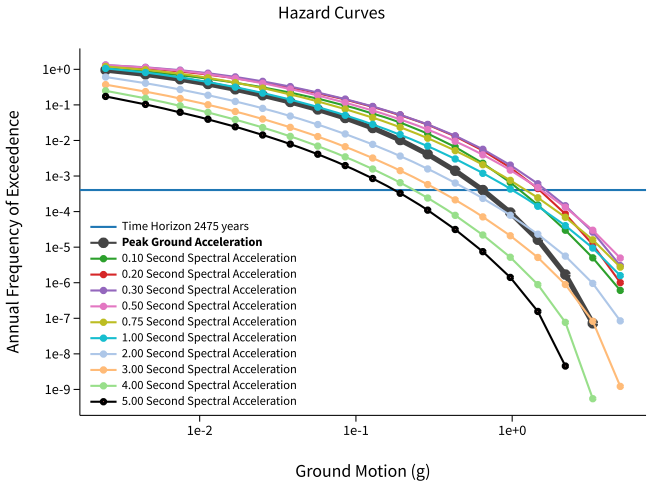
Decimal degrees, negative values for western longitudes

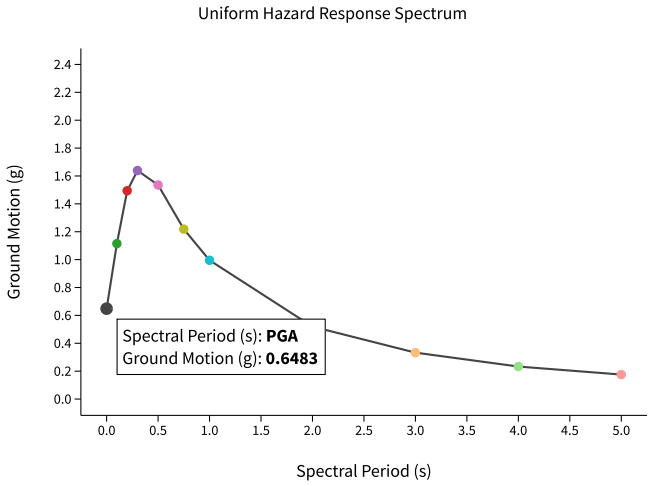
-117.8899

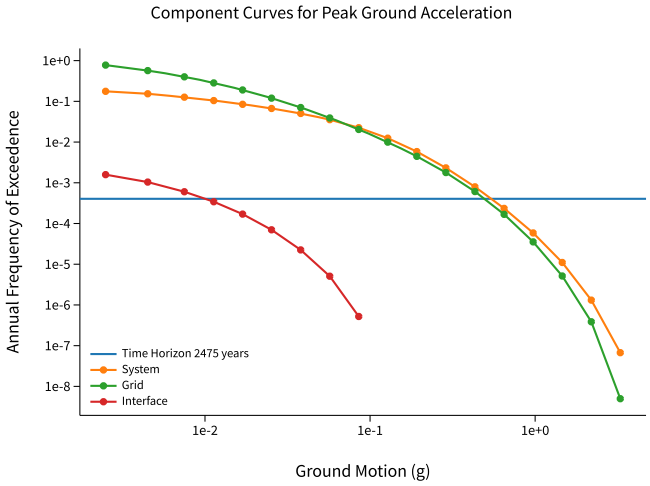
Site Class

259 m/s (Site class D)

Hazard Curve





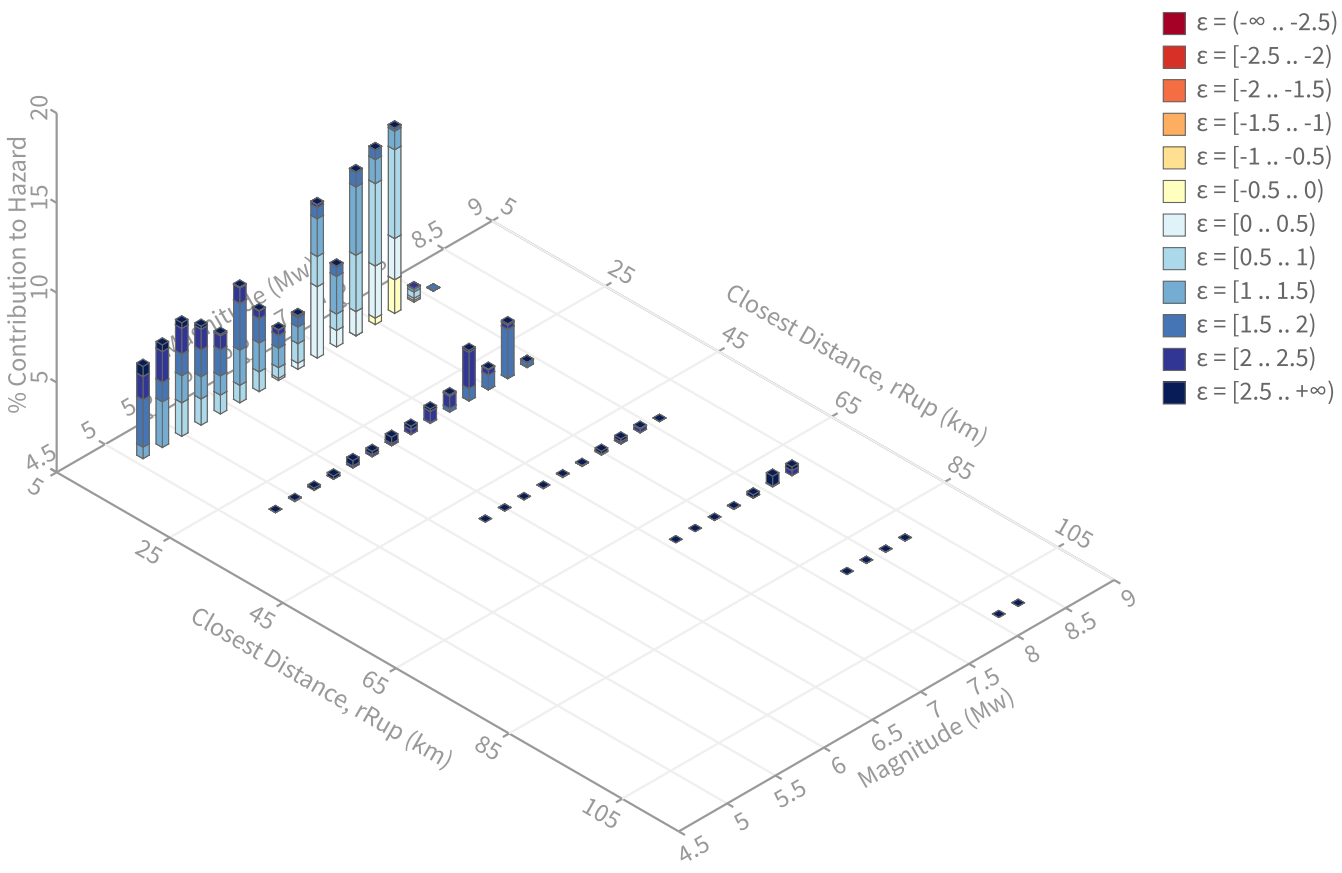


[View Raw Data]

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.64830776 g

Recovered targets

Return period: 2964.6396 yrs
Exceedance rate: 0.00033730913 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.07 %

Mean (over all sources)

m: 6.67
r: 11.46 km
ε_0: 1.28 σ

Mode (largest m-r bin)

m: 7.69
r: 6.58 km
ε_0: 0.54 σ
Contribution: 10.32 %

Mode (largest m-r-ε_0 bin)

m: 7.68
r: 7.37 km
ε_0: 0.67 σ
Contribution: 4.94 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							30.77
San Joaquin Hills [0]		3.22	7.14	0.44	117.895°W	33.672°N	204.03	10.90
Newport-Inglewood alt 2 [0]		7.87	7.49	0.84	117.956°W	33.638°N	232.07	5.82
Compton [0]		15.29	7.35	1.13	118.043°W	33.702°N	279.77	3.47
Palos Verdes [6]		25.96	7.46	2.00	118.134°W	33.567°N	240.77	1.78
Newport-Inglewood (Offshore) [0]		10.27	6.59	1.56	117.915°W	33.591°N	192.91	1.20
Whittier alt 2 [2]		26.88	7.65	1.89	117.746°W	33.891°N	29.58	1.07
UC33brAvg_FM31	System							27.19
San Joaquin Hills [0]		3.22	7.52	0.34	117.895°W	33.672°N	204.03	7.58
Newport-Inglewood alt 1 [0]		7.99	7.45	0.84	117.958°W	33.639°N	233.47	6.43
Compton [0]		15.29	7.27	1.17	118.043°W	33.702°N	279.77	3.30
Palos Verdes [6]		25.96	7.29	2.10	118.134°W	33.567°N	240.77	1.65
Whittier alt 1 [2]		26.95	7.59	1.92	117.749°W	33.893°N	28.85	1.40
Newport-Inglewood (Offshore) [0]		10.27	6.50	1.60	117.915°W	33.591°N	192.91	1.30
UC33brAvg_FM31 (opt)	Grid							21.16
PointSourceFinite: -117.890, 33.703		5.71	5.61	1.17	117.890°W	33.703°N	0.00	4.77
PointSourceFinite: -117.890, 33.703		5.71	5.61	1.17	117.890°W	33.703°N	0.00	4.77
PointSourceFinite: -117.890, 33.757		8.95	5.94	1.54	117.890°W	33.757°N	0.00	1.58
PointSourceFinite: -117.890, 33.757		8.95	5.94	1.54	117.890°W	33.757°N	0.00	1.58
PointSourceFinite: -117.890, 33.766		10.17	5.77	1.76	117.890°W	33.766°N	0.00	1.06
PointSourceFinite: -117.890, 33.766		10.17	5.77	1.76	117.890°W	33.766°N	0.00	1.06
UC33brAvg_FM32 (opt)	Grid							20.88
PointSourceFinite: -117.890, 33.703		5.73	5.60	1.18	117.890°W	33.703°N	0.00	4.60
PointSourceFinite: -117.890, 33.703		5.73	5.60	1.18	117.890°W	33.703°N	0.00	4.60
PointSourceFinite: -117.890, 33.757		8.97	5.93	1.54	117.890°W	33.757°N	0.00	1.59
PointSourceFinite: -117.890, 33.757		8.97	5.93	1.54	117.890°W	33.757°N	0.00	1.59
PointSourceFinite: -117.890, 33.766		10.19	5.76	1.77	117.890°W	33.766°N	0.00	1.10
PointSourceFinite: -117.890, 33.766		10.19	5.76	1.77	117.890°W	33.766°N	0.00	1.10

Liquefaction Susceptibility Analysis: SPT Method

Leighton

Youd and Idriss (2001), Martin and Lew (1999)

Description: Costa Mesa FS No. 2; Case 1; PGAm 0.614; design GW 20; No overex 0

Project No.: 24475

Jun 2024

General Boring Information:

Boring No.	Existing GW Depth (ft)	Design GW Depth (ft)	Design Fill Height (ft)	Overex. depth bgs (ft)	Ground Surface Elev (ft)	design gw elve
LB-1	24	20		0	39	19
LB-2	24	20		0	38	18
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0

Boring Location Coordinates	
X (ft)	Y (ft)
30.8	176.3
87.4	227.8

General Parameters:

a_{max} = 0.61g

M_W = 7.69

MSF eq: 1

MSF = 0.94

Hammer Efficiency = 84

C_E = 1.40

C_B = 1

C_S for SPT? TRUE

Unlined, but room for liner

Rod Stickup (feet) = 3

Ring sample correction = 0.65

Summary of Liquefaction Susceptibility Analysis: SPT Method

Leighton

Liquefaction Method: Youd and Idriss (2001). Seismic Settlement Method: Tokimatsu and Seed (1987) and Martin and Lew (1999).

Project: Costa Mesa FS No. 2; Case 1; PGAm 0.614; design GW 20; No overex 0

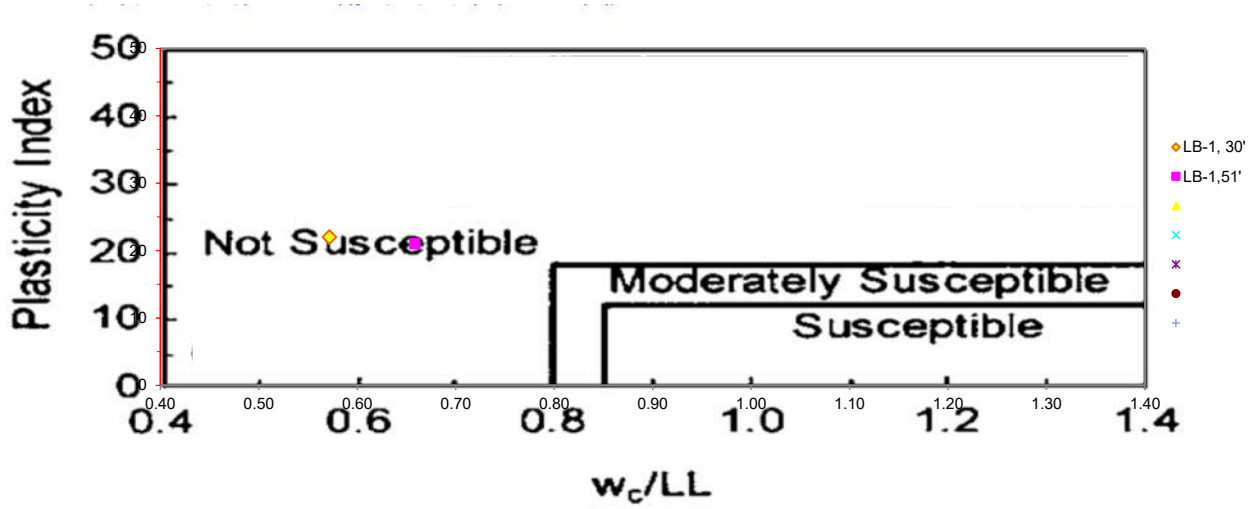
Project No.: 24475

Boring No.	Approx. Layer Depth (ft)	SPT Depth (ft)	Approx Layer Thick-ness (ft)	Plasticity ("n"=non susc. to liq.)	Estimated Fines Cont (%)	γ_t (pcf)	N_m or B (blows/ft)	Sampler Type (enter 2 if mod CA Ring)	Cs	N_m (corrected for Cs and ring->SPT) (blows/ft)	Exist σ_{vo}' (psf)	$(N_1)_{60}$	$(N_1)_{60CS}$	**$CRR_{7.5}$**	Design σ_{vo}' (psf)	$CSR_{7.5}$	CSR_M	**Liquefaction Factor of Safety**	$(N_1)_{60CS}$ (for Settle-ment) (blows/ft)	Dry Sand Strain (%) (Tok/ Seed 87) (%)	Sat Sand Strain (%) (Tok/ Seed 87) (%)	Seismic Sett. of Layer (in.)	**Cummulative Seismic Settlement** (in.)
LB-1	0 to 3.8	2.5	3.8		65	120	40	2	1	26.0	300	46.4	60.7	>Range	300	0.40	0.42	**NonLiq**	60.7	0.01		0.00	0.1
LB-1	3.8 to 6.3	5	2.5		65	120	41	2	1	26.7	600	47.6	62.1	>Range	600	0.39	0.42	**NonLiq**	62.1	0.01		0.00	0.1
LB-1	6.3 to 8.8	7.5	2.5		50	120	23	2	1	15.0	900	25.5	35.6	>Range	900	0.39	0.42	**NonLiq**	35.6	0.06		0.02	0.1
LB-1	8.8 to 11.3	10	2.5		25	120	29	2	1	18.9	1200	29.6	37.3	>Range	1200	0.39	0.42	**NonLiq**	37.3	0.09		0.03	0.1
LB-1	11.3 to 13.8	12.5	2.5		75	120	39	2	1	25.4	1500	35.6	47.7	>Range	1500	0.39	0.41	**NonLiq**	47.7	0.03		0.01	0.1
LB-1	13.8 to 17.5	15	3.8		55	120	38	2	1	24.7	1800	31.7	43.0	>Range	1800	0.39	0.41	**NonLiq**	43.0	0.02		0.01	0.0
LB-1	17.5 to 20.0	20	2.5		55	120	16	1	1.25	19.9	2400	24.7	34.7	>Range	2400	0.38	0.41	**NonLiq**	34.7	0.10		0.03	0.0
LB-1	20.0 to 22.5	20	2.5		55	120	16	1	1.25	19.9	2400	24.7	34.7	>Range	2400	0.38	0.41	**NonLiq**	34.7			0.00	0.0
LB-1	22.5 to 27.5	25	5.0		50	120	46	2	1	29.9	2938	33.5	45.2	>Range	2688	0.42	0.45	**NonLiq**	45.2			0.00	0.0
LB-1	27.5 to 32.5	30	5.0	n	**79**	120	11	1	1.14	12.5	3226	14.1	22.0	>Range	2976	0.45	0.48	**NonLiq**	22.0			0.00	0.0
LB-1	32.5 to 37.5	35	5.0		75	120	37	2	1	24.1	3514	26.0	36.1	>Range	3264	0.46	0.49	**NonLiq**	36.1			0.00	0.0
LB-1	37.5 to 42.5	40	5.0		10	120	58	1	1.3	75.4	3802	78.2	80.8	>Range	3552	0.46	0.49	**NonLiq**	80.8			0.00	0.0
LB-1	42.5 to 47.5	45	5.0		10	120	100	2	1	65.0	4090	65.0	67.3	>Range	3840	0.45	0.48	**NonLiq**	67.3			0.00	0.0
LB-1	47.5 to 52.0	50	4.5	n	**90**	120	17	1	1.2	20.3	4378	19.7	28.6	>Range	4128	0.44	0.47	**NonLiq**	28.6			0.00	0.0
LB-2	0 to 3.8	2.5	3.8		55	120	37	2	1	24.1	300	42.9	56.5	>Range	300	0.40	0.42	**NonLiq**	56.5	0.01		0.00	0.1
LB-2	3.8 to 6.3	5	2.5		65	120	52	2	1	33.8	600	60.3	77.4	>Range	600	0.39	0.42	**NonLiq**	77.4	0.01		0.00	0.1
LB-2	6.3 to 8.8	7.5	2.5		65	120	26	2	1	16.9	900	28.8	39.6	>Range	900	0.39	0.42	**NonLiq**	39.6	0.07		0.02	0.1
LB-2	8.8 to 11.3	10	2.5		65	120	22	2	1	14.3	1200	22.4	31.9	>Range	1200	0.39	0.42	**NonLiq**	31.9	0.16		0.05	0.1
LB-2	11.3 to 13.8	12.5	2.5		65	120	35	2	1	22.8	1500	31.9	43.3	>Range	1500	0.39	0.41	**NonLiq**	43.3	0.06		0.02	0.1
LB-2	13.8 to 17.5	15	3.8		55	120	22	1	1.3	28.6	1800	36.7	49.0	>Range	1800	0.39	0.41	**NonLiq**	49.0	0.07		0.03	0.0
LB-2	17.5 to 20.0	20	2.5		45	120	50	2	1	32.5	2400	40.3	53.4	>Range	2400	0.38	0.41	**NonLiq**	53.4	0.03		0.01	0.0
LB-2	20.0 to 22.5	20	2.5		45	120	50	2	1	32.5	2400	40.3	53.4	>Range	2400	0.38	0.41	**NonLiq**	53.4			0.00	0.0
LB-2	22.5 to 27.5	25	5.0		45	120	20	1	1.29	25.8	2938	28.9	39.7	>Range	2688	0.42	0.45	**NonLiq**	39.7			0.00	0.0
LB-2	27.5 to 32.0	30	4.5		65	120	29	2	1	18.9	3226	21.2	30.5	>Range	2976	0.45	0.48	**NonLiq**	30.5			0.00	0.0

Plasticity and Liquefaction Susceptibility (based on Bray and Sancio, 2006) **Leighton**

Costa Mesa FS No. 2; Case 1; PGAm 0.614; design GW 20; No overex 0
24475
Jun 2024

Boring, depth	USCS	Fines Content	Moisture content, Wc (%)	Liquid Limit, LL	Plasticity Index, PI	wc/LL	Preliminary Susceptibility (considering only plasticity, not consistency)	Susceptibility, ignoring in situ moisture content
LB-1, 30'	CL	79	24	42	22	0.57	Not Susceptible	Not Susceptible
LB-1,51'	CL	90	27	41	21	0.658537	Not Susceptible	Not Susceptible



Reference:

Bray, J.D., and Sancio, R.B., 2006, Assessment of the Liquefaction Susceptibility of Fine-Grained Soils, Journal of Geotechnical and Geoenvironmental Engineering, American Society of Civil Engineers, Vol. 132, No. 9, dated September 1, 2006, pp. 1165-1177.

APPENDIX D

GENERAL EARTHWORK AND GRADING SPECIFICATIONS FOR ROUGH GRADING

LEIGHTON CONSULTING, INC.

GENERAL EARTHWORK AND GRADING SPECIFICATIONS FOR ROUGH GRADING

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LEIGHTON CONSULTING, INC.

GENERAL EARTHWORK AND GRADING SPECIFICATIONS FOR ROUGH GRADING

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E - Transition Lot Fills and Side Hill Fills	Rear of Text

1.0 General

1.1 Intent: These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 The Geotechnical Consultant of Record: Prior to commencement of work, the owner shall employ the Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultants shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all key bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to determine the attained level of compaction. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 The Earthwork Contractor: The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The

Contractor shall be solely responsible for performing the grading in accordance with the plans and specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified.

2.0 Preparation of Areas to be Filled

2.1 Clearing and Grubbing: Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent of organic matter. Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

2.2 Processing: Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 Overexcavation: In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 Benching: Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for the fill.

2.5 Evaluation/Acceptance of Fill Areas: All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

3.0 Fill Material

3.1 General: Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 Oversize: Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 Import: If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

4.0 Fill Placement and Compaction

4.1 Fill Layers: Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 Fill Moisture Conditioning: Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557-91).

4.3 Compaction of Fill: After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557-91). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 Compaction of Fill Slopes: In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557-91.

4.5 Compaction Testing: Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.6 Frequency of Compaction Testing: Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 Compaction Test Locations: The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided.

5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

6.0 Excavation

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 Trench Backfills

7.1 Safety: The Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

7.2 Bedding and Backfill: All bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum of 90 percent of maximum from 1 foot above the top of the conduit to the surface.

The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

7.3 Lift Thickness: Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

7.4 Observation and Testing: The jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

APPENDIX E

GBA'S IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL-ENGINEERING REPORT

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed*. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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HAZARDOUS MATERIAL REMEDIATION REPORT

APPENDIX 1

MASEK CONSULTING SERVICES, INC.
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Pre-Demolition Asbestos, Lead, and Miscellaneous Toxic Materials (Universal Wastes) Survey Report

Fire Station #2 at 800 Baker Street, Costa Mesa, CA

Prepared For PBK Architects, Inc.

October 15, 2024

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Our inspection was performed on October 9, 2024.

Project-Specific Limitations

This was not a limited survey, however, the building was still occupied and to avoid objectionable damage we did not perform destructive sampling, as that would have required disturbing materials which might contain asbestos. The general limitations at the end of this report apply to all projects.

Scope of Services

We provided the following services:

Asbestos Visual Inspection and Information Review

We performed a visual examination of those areas to determine the overall construction and usage of the building(s) and to plan and coordinate the survey work, taking into account any information provided on the age and construction of the building(s). Areas of potential ACM were identified using the available information on the age of the building, construction materials present and the consultant's expertise.

Asbestos Containing Materials (ACMs) Which Are Banned

It is important not to view the dates of the laws / regulations which banned the materials listed below as absolute cut-off dates. In many cases, the laws / regulations allowed suppliers to sell their existing supplies, and the manufacturers may not have immediately been aware of the new laws / regulations. For example, we have spoken with a large manufacturer of drywall joint compound in southern California and learned that they were still manufacturing drywall joint compound with asbestos in the middle 1980s, despite the 1978 US Consumer Product Safety Commission ban (see below). Our experience inspecting thousands of buildings of all types also confirms that asbestos containing drywall joint compound was used in many buildings constructed in the middle 1980s.

- Spray applied fireproofing was banned by the 1973 Clean Air Act (CAA) Asbestos National Emission Standard for Hazardous Air Pollutant (NESHAP);

- Wet-applied and pre-formed (molded) asbestos pipe insulation and pre-formed (molded) asbestos block insulation on boilers and hot water tanks were banned by the 1975 Clean Air Act (CAA) Asbestos National Emission Standard for Hazardous Air Pollutant (NESHAP);

- Spray applied decorative ACM (e.g. acoustic ceiling texture) was banned by the 1978 Clean Air Act (CAA) Asbestos National Emission Standard for Hazardous Air Pollutant (NESHAP);

- Patching compounds which are used to cover, seal or mask cracks, joints, holes and similar openings in the trim, walls, ceiling, etc. of building interiors (also used to create textured effects) which a consumer can purchase (those where the sale

or use of the product by consumers is facilitated, and those containing respirable free form asbestos which are used in residences, schools, hospitals, public buildings or other areas where consumers have customary access) were banned by the US Consumer Product Safety Commission (CPSC) in 1978 - see 16 CFR 1304;

- Artificial emberizing materials (ash and embers) containing respirable freeform asbestos (generally packaged in an emberizing kit for use in fireplaces, and designed for use in such a manner that the asbestos fibers can become airborne under reasonably foreseeable conditions of use were banned by the US Consumer Product Safety Commission (CPSC) in 1977 - see 16 CFR 1305;

- Spray-on application of materials containing more than 1% asbestos to buildings, structures, pipes, and conduits unless the material is encapsulated with a bituminous or resinous binder during spraying and the materials are not friable after drying was banned by the 1990 Clean Air Act (CAA) Asbestos National Emission Standard for Hazardous Air Pollutant (NESHAP);

- Asbestos paper products (flooring felt, roll board, and corrugated, commercial, or specialty paper) were banned by the Toxic Substances Control Act (TSCA) - On July 12, 1989, the US EPA issued a final rule banning most asbestos-containing products. While most of that regulation was overturned by the Fifth Circuit Court of Appeals in New Orleans in 1991, the bans on these materials were affirmed; and,

- Products that have not historically contained asbestos, otherwise referred to as "new uses" of asbestos were banned by the Toxic Substances Control Act (TSCA) - On July 12, 1989, the US EPA issued a final rule banning most asbestos-containing products. While most of that regulation was overturned by the Fifth Circuit Court of Appeals in New Orleans in 1991, the bans on these materials were affirmed.

Various asbestos containing materials were specifically listed as NOT banned by the US EPA's guidance document of May 18, 1999, but this list is far from comprehensive, as many other common materials which are not banned are not listed:

Troweled-on Surfacing Materials (e.g. cement stucco and gypsum plaster);

Asbestos-cement corrugated sheet, shingles, flat sheet, millboard, and pipe;

Asbestos clothing for adults;

Pipeline wrap;

Roofing felt;

Vinyl-asbestos floor tile;

Automatic transmission components;

Clutch facings;

Friction materials;

Brake pads, linings, and blocks;

Gaskets;

Non-roofing coatings; and,

Roof coatings.

Which Materials Commonly Contain Asbestos?

Please see Mr. Masek's book, *Illustrated Practical Asbestos.*

Asbestos Sampling

Representative samples of potential / suspect ACM were collected after identification of homogeneous sampling areas (these are areas in which the materials are uniform in color, texture, construction or application date and general appearance) of potential ACM. Each homogeneous area of potential ACM was observed for material type, location, condition, and friability. Representative samples were collected from each area of potential ACM, excepting areas which were inaccessible, or areas of assumed ACM. The building(s) was examined for the presence of previous or multiple layers of materials, if applicable. If no suspect materials were identified, or if only materials assumed to contain asbestos were identified, no samples were collected.

Most of the laws and regulations regarding asbestos sampling reference the AHERA section on sampling (40CFR763.86). We used that protocol, with additions to be more conservative, but not to overly increase the cost of asbestos surveys. Given the lack of detailed guidance in AHERA regarding miscellaneous materials, our judgement and extensive experience were important factors in determining the appropriate number of samples. For example, we know that drywall joint compound is difficult for the laboratories to analyze due to the presence of binders and such and the relatively low asbestos content, so we collect more samples from an area of it than we would from a similar area of a material such as sheet vinyl flooring which is very easy to analyze and which typically was made with a relatively high asbestos content. Of course, we generally do not sample non-suspect materials (see the table of suspect materials above), except for occasional samples to avoid questions and delays during construction work.

Suspect materials were assumed to contain asbestos or were sampled as follows:

Friable Surfacing Material, which is a friable suspect material sprayed-on, troweled-on, or otherwise applied to surfaces, such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, or other purposes:

- At least three bulk samples from each homogeneous area that is 1,000 ft ^{2} or less;

- At least five bulk samples from each homogeneous area that is greater than 1,000 ft ^{2} but less than or equal to 5,000 ft ^{2}; and,

- At least seven bulk samples from each homogeneous area that is greater than 5,000 ft $^{2.}$

Friable Thermal System Insulation, is applied to pipes, fittings, boilers, breeching, tanks, ducts, or other structural components to prevent heat loss or gain, or water condensation, or for other purposes:

- At least three bulk samples from each homogeneous area;

- At least one bulk sample from each homogeneous area of patched thermal system insulation if the patched section is less than 6 linear or square feet; and,

- In a manner sufficient to determine whether the material is ACM or not ACM, bulk samples from each insulated mechanical system where cement or plaster is used on fittings such as tees, elbows, or valves.

Friable Miscellaneous Materials, which are building materials on structural components, structural members or fixtures, such as suspended ceiling panels:

- Bulk samples from each homogeneous area in a manner sufficient to determine whether the material is ACM or not ACM.

Nonfriable Materials which are building materials on structural components, structural members or fixtures, such as floor tiles:

- In a manner sufficient to determine whether the material is ACM or not ACM, bulk samples from each homogeneous area.

Page 12 of EPA document 340/1-90-018 dated December 1990 unambiguously lists plaster / stucco as non-friable materials.

Sampling was done based on the friability of the material at the time of the asbestos survey.

Reasonable care was taken to reduce accidental fiber release into the building environments. In order to reduce the potential for fiber release while collecting samples of suspect materials, the test areas were sprayed with a water-containing surfactant. The tools used for collection of samples were cleaned with soapy water-soaked cloths between samples in order to avoid cross-contamination of samples. The samples were placed into heavy plastic sample bags which were then sealed and labeled. The location, type, and other information on each sample were recorded.

Asbestos Laboratory Analysis

A chain-of-custody form accompanied the samples to the laboratory. The samples were analyzed by an NVLAP accredited laboratory using the Polarized Light Method (PLM, EPA 600/R-93/116 and/or EPA 600/M4-82-020600M4). The PLM method is, by far, the most commonly used method to analyze bulk materials for the presence of asbestos. This method utilizes the optical properties of minerals to identify the selected constituent. The use of this method enables identification of the type and approximate percentage of asbestos in a given sample. The detection limit of the PLM method for asbestos identification is about one percent by volume.

Lead Survey

The complementary lead survey included identification of suspect areas of lead (paint and ceramic tile glaze) and non-destructive In place testing using a state of the art SciAps X-550 portable XRF (X-Ray Fluorescence) instrument.

Miscellaneous Toxic Materials Survey

The following tasks were performed:

- Inspection of a representative sample of fluorescent light fixtures for the presence of PCB-containing ballasts (that not labeled as not containing PCBs and/or date coded before 1979) and fluorescent tubes containing mercury which need to be recycled;

- Identification of high intensity discharge lighting which may/does contain PCB-containing ballasts;

- Identification of mercury switches, as in thermostats, pressure/level controls, “silent” switches, and such;

- Identification of oil-cooled electrical transformers, containers of transformer oil, oil-filled capacitors, and oil filled high voltage switches not labeled as containing less than 5ppm PCBs and, if specified in our contract, testing them for PCB content (except those without sample ports, and those which are energized, which will be assumed to contain PCBs);

- Identification of refrigeration / HVAC equipment containing refrigerants; and,

- Identification of radioactive (self-illuminating) exit signs.

Asbestos Survey Findings

A Friable material is one which, when dry, may be crumbled, pulverized, or reduced to powder by hand pressure. Non-Friable materials include items such as vinyl floor tile, mastics, plastic roof cement, stucco, drywall joint compound & texture, roofing, and sheet vinyl flooring (when in place and in good condition, friable once disturbed). Over the years, we have encountered

some confusion regarding materials which are fractured, broken, or fragmented. Such damage or deterioration does not make a previously non-friable material friable if it still cannot be crumbled, pulverized, or reduced to powder by hand pressure. Materials such as pipe insulation may not be friable in place, if the fluffy asbestos is covered with wrapping in good condition.

Homogeneous Areas and Samples

To make the following table and this report readily readable, we utilize 12 point or larger type for all but the page footers and attachments. People also do not like having to turn pages to read them, especially if they are reading a screen. For the convenience of readers, we minimize the number of columns by using convenient codes for condition, disturbance potential, friability, removal, and waste handling.

Damage may be physical, due to deterioration, or due to water. Significant Damage means 10% or more evenly distributed, or 25% or greater localized damage. Damage means less than 10% damage (e.g. abraded, gouged, blistered, peeling, crumbling). Good means no or very little damage or deterioration.

Materials may be disturbed by contact, vibration, or air erosion, and all of those possible sources of disturbance are considered in determining if there is potential for significant damage, potential for damage, or low potential for damage.

Taking all of those factors into consideration, materials which contain asbestos (those containing over 1% asbestos are Asbestos Containing Materials) are categorized according to the following Hazard Rank scale:

worst	7 -	Friable with significant damage
	6a -	Friable with damage and potential for significant damage
	6b -	Non-Friable with significant damage and potential for more significant damage
	5a -	Friable with damage and potential for damage
	5b -	Non-Friable with significant damage and potential for additional damage
	5c -	Non-Friable with damage and potential for significant damage
	5d -	Friable in good condition and potential for significant damage
	4a -	Non-Friable with significant damage and low potential for disturbance
	4b -	Friable with damage and low potential for disturbance
	3a -	Friable in good condition and potential for damage
	3b -	Non-Friable with damage and potential for damage
	3c -	Non-Friable in good condition and potential for significant damage
	2a -	Friable in good condition and low potential for disturbance
	2b -	Non-Friable with damage and low potential for disturbance
	2c -	Non-Friable in good condition and potential for damage
best	1 -	Non-Friable in good condition and low potential for disturbance

Category I non-friable ACM is any asbestos-containing packing, gasket, resilient floor covering or asphalt roofing product which contains more than one percent (1%) asbestos as determined using polarized light microscopy (PLM) according to the method specified in Appendix A, Subpart F, 40 CFR Part 763. (Sec. 61.141), or assumed to be such.

Category II non-friable ACM is any material, excluding Category I non-friable ACM, containing more than one percent (1%) asbestos as determined using polarized light microscopy according to the methods specified in Appendix A, Subpart F, 40 CFR Part 763 that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure. (Sec. 61.141), or assumed to be such.

If all or portions of materials which contain asbestos are removed (using typical methods and equipment), the following Waste codes indicate how the waste should be disposed:

F - Friable, hazardous asbestos waste;

NF - Non-Friable, non-hazardous asbestos waste,

O - OSHA regulations regarding materials containing greater than zero, but less than 1% asbestos apply. Dispose as construction debris or non-friable asbestos waste, depending on the requirements of the landfill where the waste is disposed.

Suspect materials which are not sampled must be assumed to contain asbestos. Materials are typically assumed to contain asbestos due to the material being readily identifiable (e.g. asbestos-cement items), or lack of access.

We generally omit the prefix of the sample numbers from the sketch(es) or drawings for clarity. Such prefixes are used solely to prevent the laboratory from accidentally mixing samples from different batches.

Please see the Scope of Services section above for information on our sampling protocols.

We use the words “roughly” or “approximately” with quantities to prevent contractor change orders for minor variations in quantity. Contractors should verify the site conditions, material location(s), and quantities to their satisfaction prior to committing to a price for removal work.

Homogeneous Area (an area of material uniform in color, texture, construction or application date and general appearance)	Sample Number	Specific Sample Location If one or more samples contain asbestos, the entire homogeneous area must be treated as asbestos containing	Lab. Result % or **N**one **D**etec ted	Asbestos Containing Materials	
				Hazard Rank	Waste
top (thin, white) layer of plaster on walls and ceilings	800-1	in the electrical closet off garage, at existing hole	ND	3c	O
	800-6	in the supply closet off day room	ND		
	800–10	in the exercise room where damaged	ND		
	800-13	in the corridor at the door where damaged	<1		

Homogeneous Area (an area of material uniform in color, texture, construction or application date and general appearance)	Sample Number	Specific Sample Location If one or more samples contain asbestos, the entire homogeneous area must be treated as asbestos containing	Lab. Result % or **N**one **D**etected	Asbestos Containing Materials	
				Hazard Rank	Waste
bottom (gray) layer of plaster	800-2	in the electrical closet off garage, at existing hole	ND	3c	O
	800-7	in the supply closet off day room	ND		
	800-11	in the exercise room where damaged	ND		
	800-14	in the corridor at the door where damaged	<1		
drywall joint compound & texture in the remodeled dormitory/kitchen areas	800-3	on a partial wall in the dormitory	ND		
	800-4	on the corner of the corridor in the dormitory area, where damaged	ND		
	800-5	in the dormitory corridor where damaged	ND		
	800-8	on the corner in the kitchen where damaged	ND		
	800-9	in the kitchen at window where damaged	ND		
	800-12	over plaster above the door from the office to the garage	ND		
top (color) layer of stucco	800-15	on the recreation room corner where damaged	ND	3c	O
	800-17	right rear corner near water heater closet	ND		
	800-23	on the garage at roof level	<1		
bottom (gray) layer of stucco	800-16	on the recreation room corner where damaged	ND		
	800-18	right rear corner near water heater closet	ND		
	800-24	on the garage at roof level	ND		

Homogeneous Area (an area of material uniform in color, texture, construction or application date and general appearance)	Sample Number	Specific Sample Location If one or more samples contain asbestos, the entire homogeneous area must be treated as asbestos containing	Lab. Result % or **N**one **D**etec ted	Asbestos Containing Materials	
				Hazard Rank	Waste
roofing under the tar and rocks	800-19	rear right section	ND		
	800-21	front right corner	ND		
brown tar paper under roofing	800-20	rear right section	ND		
	800-22	front right corner	ND		
plastic roof cement spots	800-25	around the sewer vent, front right	ND		
	800-26	around the sewer vent, back right	ND		
	800-27	on HVAC metal duct work	ND		
	800-28	where the HVAC duct goes through the roof	ND		
assumed asbestos cement panel on the roof level, roughly 12 Sq. Ft.	**N/a**	**n/a - assumed, identified visually**	**n/a**	**1**	**NF**

Lead (paint and ceramic tile) Survey Findings

No lead-based paint (XRF readings greater than or equal to 1.0 mg/cm^2 in most places) was identified.

No lead-glazed ceramic tile (XRF readings >= 1.0 mg/cm^2)was identified.

Solid lead sewer vent flashings were identified on the roof.

Lead Survey Samples

A room equivalent is an identifiable part of a building (e.g., room, exterior, corridor, stairway, foyer, Etc.). Closets or other similar areas adjoining rooms are not considered as separate room equivalents unless they are obviously dissimilar from the adjoining room equivalent.

The regulations require one reading from each testing combination, except for walls, where one reading is required from each wall (up to a maximum of four readings from the largest walls in testing combinations with more than four walls).

Each testing combination may be composed of more than one building component (such as two similar windows within a room equivalent).

For multifamily developments or apartment buildings, common areas and exterior sites are

treated as separate types of units, not as room equivalents.

If similar building component types with identical substrates (such as windows) are all found to contain lead paint in the first five interior room equivalents, testing of that component type in the remaining room equivalents may be discontinued.

Surfaces covered with wallpaper are assumed to be painted.

For varnished, stained, or similar clear-coated floors, measurements in only one room equivalent are permissible if it appears that the floors in the other room equivalents have the same coating.

Some testing combinations have multiple parts. For example:

- All of the parts of an interior window sash;
- All of the parts of the window frame and trim (casings, stops, jambs, aprons, Etc.);
- All of the parts of baseboard assembly (main board, quarter round, and so forth);
- All of the parts of a door (stiles, rails, panels, mullions, panels, Etc.); and,
- All of the parts of a door frame assembly (jambs, stops, transoms, casings, Etc.).

Because it is highly unlikely that all the parts would have different painting histories, they are not considered separate testing combinations, unless we have substantial evidence that different parts have separate, distinct painting histories.

When the plus or minus indication on the XRF instrument is such that adding the amount indicated to the reading would cause it to be equal to or over the positive level (1 or 0.7, depending on the locality), we add it and report that amount.

Testing Combinations			Color	Condition G - good F- fair P- poor	Lead mg/cm^2
Room Equivalent	Component	Substrate W - wood P - plaster S - stucco M - metal D - drywall			
	calibration 1.04				1.1
	Calibration 1.04				1.1
	Calibration 1.04				1.0
Exterior	parking lot stripes	asphalt	white	g	0.00
	“	“	blue	g	0.00
	wall	s	tan	g	0.00
	wall	s	tan	g	0.00

Testing Combinations			Color	Condition G - good F- fair P- poor	Lead mg/cm^2
Room Equivalent	Component	Substrate W - wood P - plaster S - stucco M - metal D - drywall			
	down spout	m	tan	g	0.00
	roof ladder	m	tan	g	0.1
	Roll up door frame	m	tan	g	0.00
	wall	s	tan	g	0.00
Garage	floor	concrete	red	g	0.00
	wall	s	tan	g	0.00
	side door	m	gray	g	0.1
	Door	m	gray	g	0.00
Locker	wall	d	white	g	0.02
	door frame to garage	m	red	g	0.5
Garage	wall	d	white	g	0.2
	Wall stripe	d	red	f	0.2
	Door frame to dormitory	m	tan	g	0.3
	Door	w	tan	g	0.05
	wall	p	white	g	0.00
dormitory	wall	d	white	g	0.00
	door frame	w	white	g	0.00
	door	w	white	g	0.00
	wall	d	white	g	0.00
	door frame	w	white	g	0.00
	door	w	white	g	0.00
	wall	d	white	g	0.00
	closet door frame	w	white	g	0.2
	Closet door	w	white	g	0.5
	Wall	d	white	g	0.00
	locker room door frame	w	white	g	0.00
	door	w	white	g	0.00
	locker cabinet	w	natural wood	g	0.00
	shower wall	epoxy coating	multi	g	0.00
Restroom	wall	p	white	g	0.5
	Wall	p	white	g	0.4

Testing Combinations			Color	Condition G - good F- fair P- poor	Lead mg/cm^2
Room Equivalent	Component	Substrate W - wood P - plaster S - stucco M - metal D - drywall			
	Stall	m	beige	g	0.1
	Door frame	w	white	g	0.00
	door	w	white	g	0.00
Corridor	ceiling	p	white	g	0.2
	Door to exercise room	w	white	g	0.8
	Door	w	white	g	0.2
Exercise	wall	p	white	g	0.00
	closet door	w	white	g	0.6
	Door frame	w	white	g	0.1
	Door to exterior	w	beige	g	0.00
	door frame	w	gray	g	0.1
	Wall	p	white	g	0.00
Kitchen	wall	d	white	g	0.00
	ceiling	d	white	g	0.00
	wall	d	white	g	0.00
	cabinets	w	natural	g	0.00
	floor	ceramic tile	pink	g	0.00
	door to exterior	w	white	g	0.2
	Closet door frame	w	white	g	0.3
	Closet door	w	white	g	0.7
Corridor	door frame	w	white	g	0.00
	door to day room	w	white	g	0.1
	Door to exercise room	w	white	g	0.7
	Wall	p	white	g	0.00
Captain’s	door frame	w	white	g	0.00
	door	w	white	g	0.6
	Wall	p	white	g	0.00
	restroom door frame	w	white	g	0.2
	Door frame	w	white	g	0.5
	Restroom wall	p	white	g	0.02
Dormitory	wall	p	white	g	0.1
	door frame	w	white	g	0.00

Testing Combinations			Color	Condition G - good F- fair P- poor	Lead mg/cm^2
Room Equivalent	Component	Substrate W - wood P - plaster S - stucco M - metal D - drywall			
	door	w	white	g	0.00
	wall	p	white	g	0.00
Corridor	wall	p	white	g	0.00
	door to garage	w	gray	g	0.6
	Door frame	w	gray	g	0.7
	Wall	p	white	g	0.00
work shop	door frame	m	red	g	0.3
	Wall	p	white	g	0.2
Laundry	door frame	m	red	g	0.3
	Wall	p	white	g	0.4
Utility	door frame	m	red	g	0.2
	Wall	p	white	g	0.2
	Electrical cabinet	m	gray	g	0.1
Garage	roll up door	m	gray	g	0.00
	calibration 1.04				1.1

Miscellaneous Toxic Materials (universal wastes) Survey Findings

We examined the building(s) and identified the following materials:

Batteries

We observed batteries in emergency lights.

Fluorescent and HID Lamps/Bulbs and Ballasts

8' Tubes	4' Tubes	PCB Fluorescent Ballasts	HID Lamps & Ballasts
	170	0	0

Refrigerants

We observed one split system unit on the roof.

Mercury

We observed no mercury switches.

Miscellaneous Drums / Containers and Oil-Filled Devices

We observed various cleaning and maintenance materials.

Radioactive Exit Signs

We observed none.

Building Description and Photographs

The photographs are important parts of the descriptive information.

The subject property contains a fire house probably built in the 1960's. The exterior is finished with stucco and masonry walls. The roof is covered with tar & rocks over roll roofing. The interior is finished with plaster, drywall in remodeled areas of kitchen and dormitory, carpet on concrete, ceramic tile on the kitchen floor, non-slip coating on the restroom floor. Metal HVAC ducts were observed on the roof. No insulated pipes were observed at the plumbing hatch. We did not open the walls as the building was still occupied.



Photo 1:The back of the station

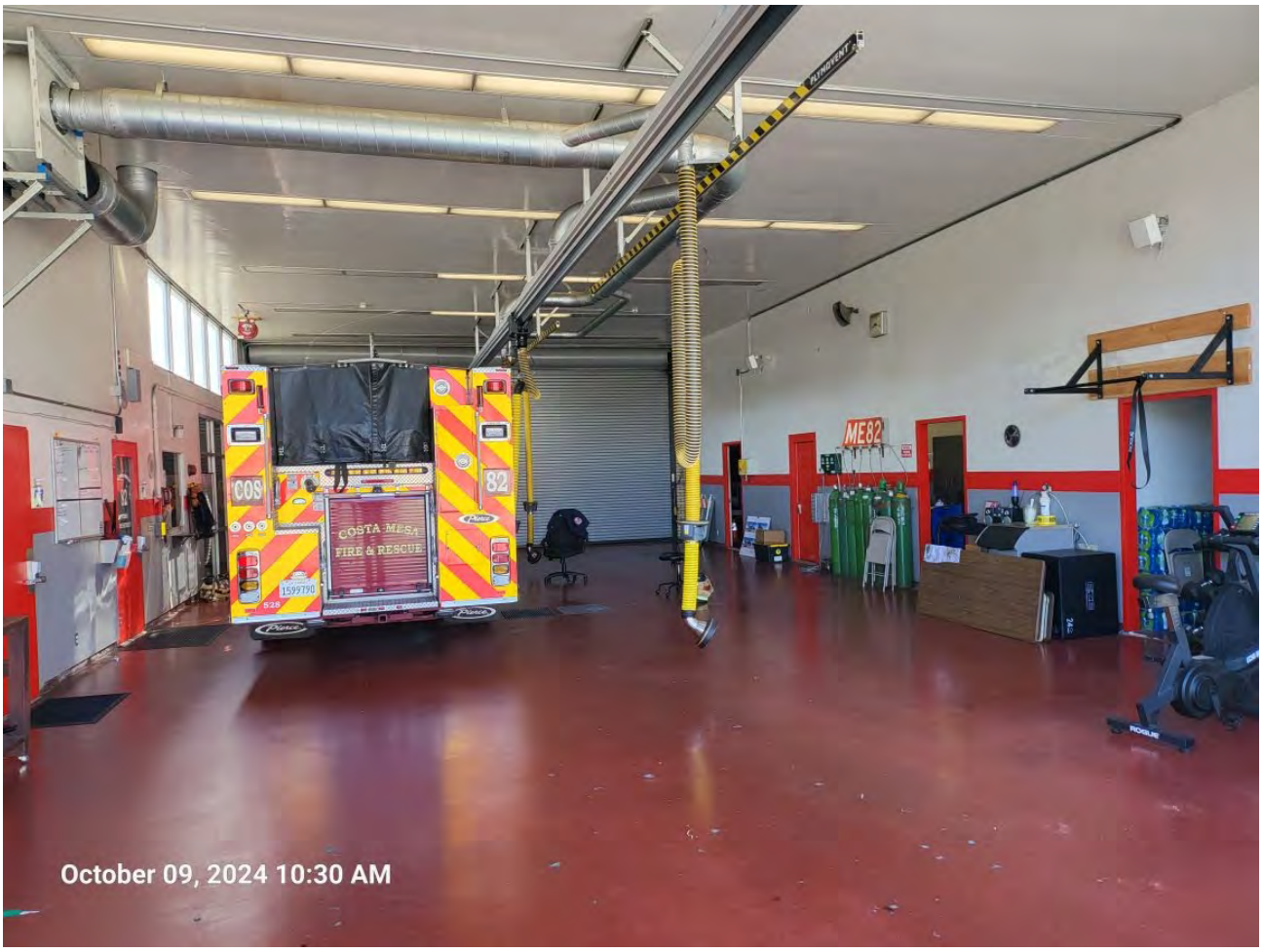


Photo 2: The garage



Photo 3: The clothing and equipment room



Photo 4: The shop and laundry room area



Photo 5:The main electrical and phone room



Photo 6: The dormitory area with newer partial walls of drywall



Photo 7:The main restroom



Photo 8: We did not observe any pipe insulation, but some may be present and hidden from view



Photo 9: The kitchen



Photo 10: One of the locations where we observed clean concrete under the carpet (and nothing visible under the ceramic tile)

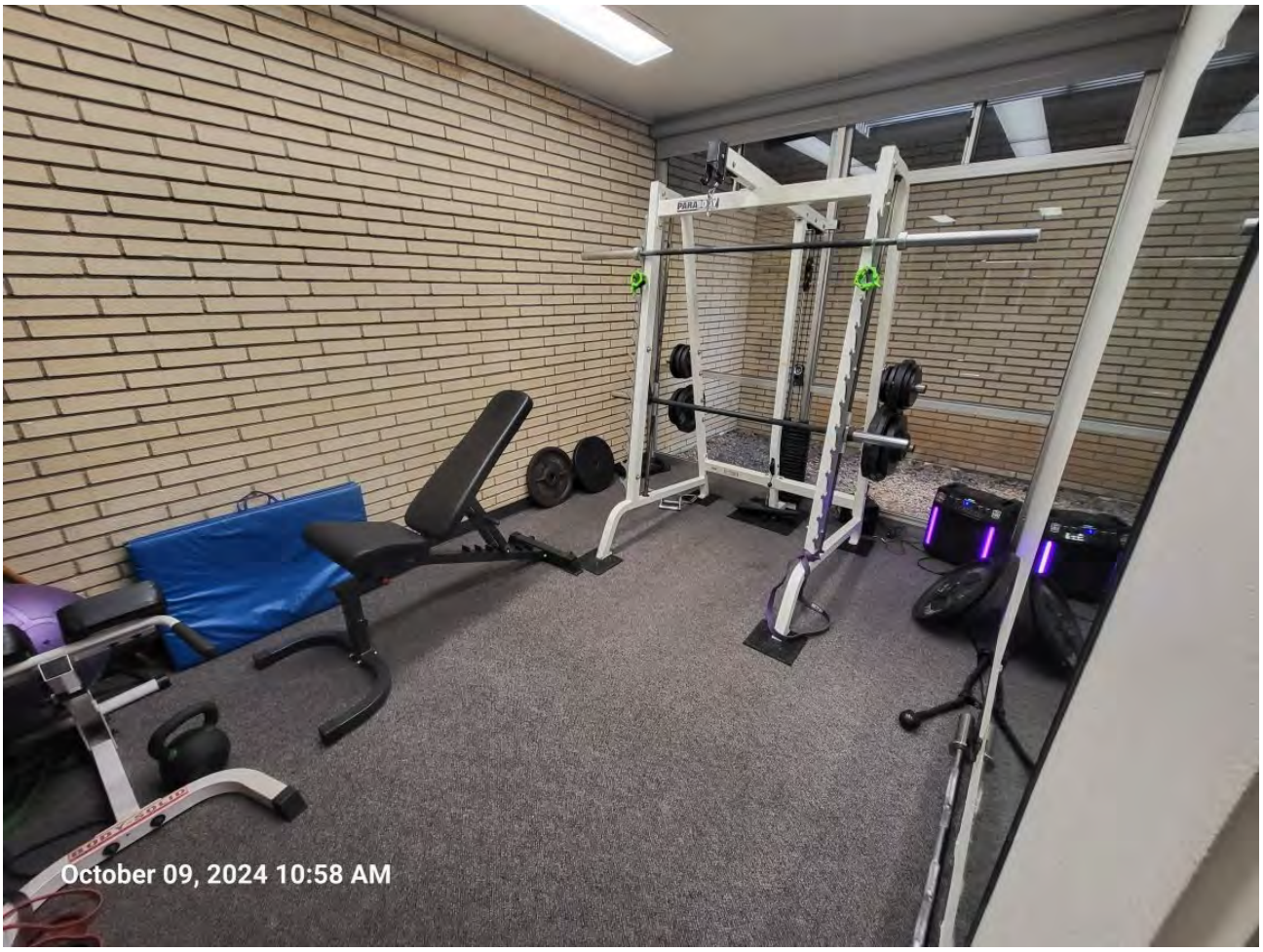


Photo 11: The small work-out room

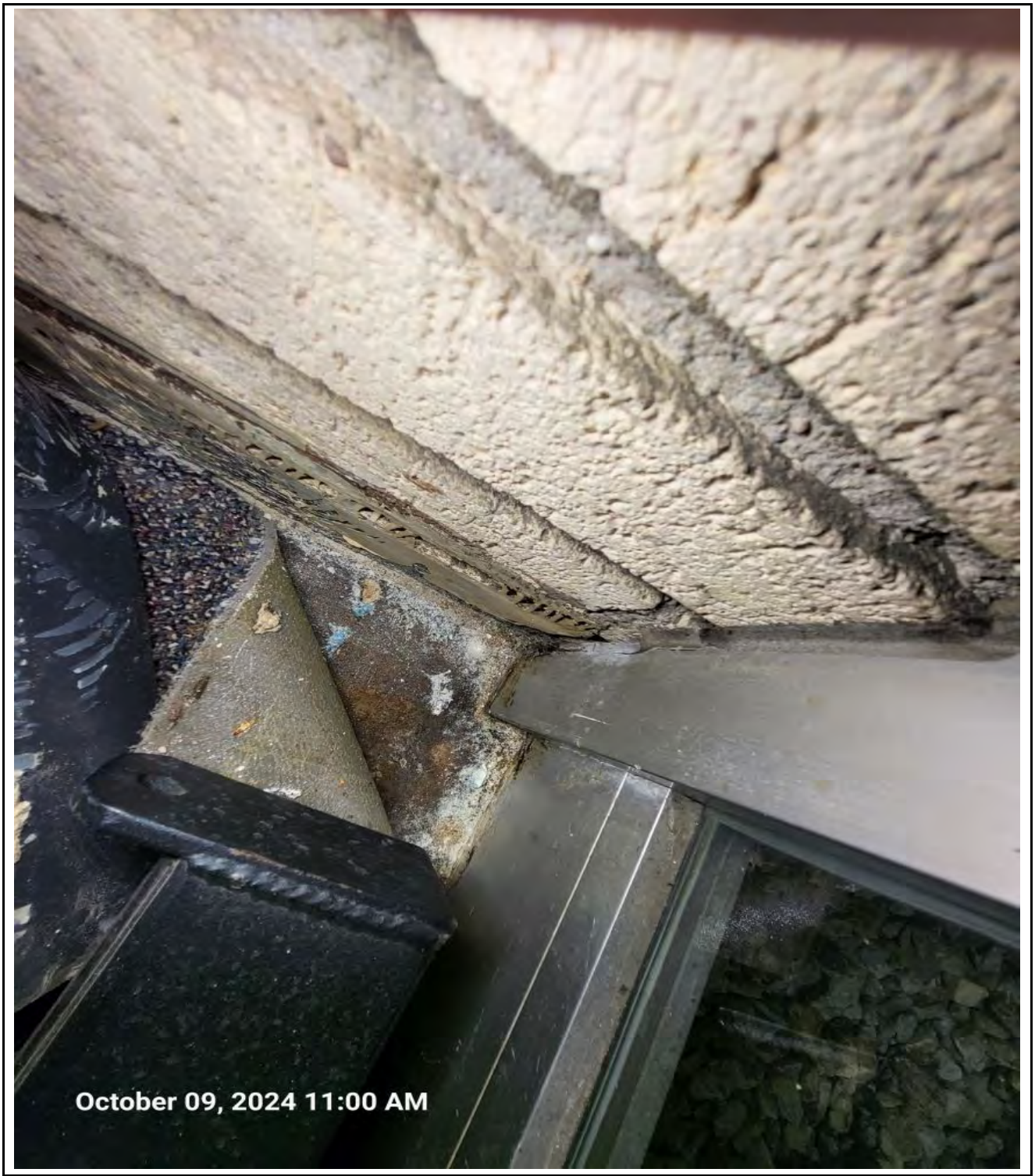


Photo 12:Another example of the several locations where we observed clean concrete under the carpet



Photo 13: The roof and the one HVAC unit



Photo 14: A typical lead flashing at a vent pipe



Photo 15: The asbestos-cement window panel

Recommendations

All persons who read and use this report should read the entire report and all of the attachments.

While not required by any laws or regulations (except for certain work in schools), we highly recommend that all clients have us oversee, monitor, and document remediation and/or abatement work for all but the smallest projects. It is routine for many clients, especially "deep pocket" organizations and major property owners and managers. However, all clients would benefit from having us present to quickly identify deficiencies, make decisions on unusual conditions encountered, and document how the work was done. This is important for preventing costly problems and delays during the work. It is also vital for defending against claims of deficiencies which arise during or after, sometimes years after, the work is performed.

Information on laws and regulations is provided as a convenience, not as a substitute for proper legal advice and review of the entire text of the applicable laws and regulations.

Miscellaneous Toxic Materials

There are numerous laws and regulations covering the handling, transport, and disposal of toxic materials. All of the miscellaneous toxic materials should be properly handled, packed, transported and disposed by workers with proper training and personal protective equipment, including, but not limited to:

- Proper removal and disposal of all batteries, with recycling of all lead-acid batteries;
- Assuming that all fluorescent lamp tubes and mercury-vapor lamps contain levels of mercury which require that they be properly disposed, and careful removal and packing of them, then transport to a recycling company;
- Assuming that all lamp ballasts / HID ballasts contain PCBs, except those found to be marked / date coded as not containing PCBs, and removal and packing for recycling and disposal by transportation to a recycling company (***not land fill disposal***);
- Proper removal and disposal of all devices containing oils, such as air conditioning compressors, pumps, compressors, etc.;
- Proper removal and disposal of all refrigerants from all equipment containing refrigerants, such as chillers, air conditioners, water coolers, and refrigerators/freezers (the technician(s) performing the refrigerant recovery must be trained and certified under Section 608 of the Clean Air Act, 40CFR Part 82); and,
- Collection, packaging, and proper disposal (by recycling) all mercury containing switches and mercury thermometers.

Limitations of Polarized Light Microscopy (PLM) Analytical Methods

It is possible that materials reported to contain less than 1% asbestos by Polarized Light Microscopy (PLM) analysis may or may not actually contain asbestos. Non-friable Organically Bound (NOB) such as floor tiles (vinyl and asphalt), roofing materials, mastics, and caulking may contain asbestos which is tightly bound to the matrix material and therefore not easily isolated and detected by microscopy. PLM many not detect asbestos fibers less than 0.2 microns in diameter. Because asbestos fibers found in NOB materials may be less than 0.1 microns in diameter, this method can sometimes yield low estimates or even false negative results. In New York, both PLM and TEM analysis is required in order to declare that samples of NOB materials do not contain asbestos. Clients in other areas may wish to have samples of non-friable organically bound materials reported as "none detected" under PLM analysis re-analyzed by TEM.

No SCAQMD Abatement Notification Required

As less than 100 square feet of Asbestos Containing materials (the one small window panel) were identified, no abatement notification to the South Coast Air Quality Management District (SCAQMD) is required.

Notifications to Employees, Contractors, Tenants, and the Public:

1) Building owners must notify their employees and other owners (e.g of tenant companies) within 15 days of their knowledge of the presence of asbestos containing materials (Connelly Act, AB 3713, California Health and Safety Code, Section 25915), and annually thereafter.

2) Federal OSHA construction asbestos regulations, 29CFR1926.1101 (k), and the corresponding California regulations, apply to communication of hazards during construction activities.

3) Federal OSHA general industry asbestos regulations, 29CFR1910.1001(j)(2)(i), and the corresponding California regulations, require that building owners determine the presence, location, and quantity of materials which contain asbestos at the work site, and inform employees about the presence and location of those materials. Again, tenants are not employees. While this aspect of the regulation is widely ignored, as most commercial building have either not been inspected for asbestos, or only partially inspected, we suggest that all building owners implement an asbestos management (O&M) program based on at least a walkthrough asbestos survey. Asbestos was used in many common building materials up to the late 1980s, so having an asbestos management program in place minimizes liability and costs.

4) Federal OSHA general industry asbestos regulations, 29CFR1910.1001(j)(2)(iii) requires that building owners inform employers of employees, and employers inform employees who will perform housekeeping activities in areas which contain asbestos (actual or presumed) of the presence and location of those materials which may be contacted during such activities.

5) Federal OSHA general industry asbestos regulations, 29CFR1910.1001(j)(4)(i), and the corresponding California regulations, require that building owners or employers affix or post labels or signs so that employees will be notified of what materials contain, or are presumed to contain, asbestos. The labels are to be attached in such areas where they will clearly be noticed by employees who are likely to be exposed, such as at the entrance to mechanical room/areas. The labels must comply with the requirements of 29 CFR 1910.1200(f) of OSHA's Hazard Communication standard, and must include the following information:

DANGER

CONTAINS ASBESTOS FIBERS

AVOID CREATING DUST

CANCER AND LUNG DISEASE HAZARD

6) There is a slight variation in wording of the warnings in California's Connelly Act, AB 3713, California Health and Safety Code, Section 25915:

CAUTION.

ASBESTOS.

CANCER AND LUNG DISEASE HAZARD.

DO NOT DISTURB WITHOUT PROPER TRAINING AND EQUIPMENT

so we usually develop signs and labels which are a combination of the California and OSHA wording.

7) In a January 24, 1996 letter to Ms. Lisa K. Rushton interpreting their 29CFR1910.1101 and 29CFR1926.1101 regulations, OSHA stated: "Signs and labels are required to be posted on or near the product. However, it is generally not feasible to put labels on walls and floors. If it is not feasible, alternatives may be used. For example, if asbestos containing floors are being serviced by employees using a common equipment room day after day, then a sign or label for the asbestos flooring can be posted in that room."

8) California's Connelly Act, AB 3713, California Health and Safety Code, Section 25915, Sub-Section 25915.5 states: "An owner required to give notice to employees pursuant to this chapter, in addition to notifying his or her employees, shall mail, in accordance with this subdivision, a copy of that notice to all other persons who are owners of the building or part of the building, with whom the owner has privity of contract. Receipt of a notice pursuant to this section by an owner, lessee or operator shall constitute knowledge that the building contains asbestos-containing construction materials for purposes of this chapter. Notice to an owner shall be delivered by first-class mail addressed to the person and at the address designated for the receipt of notices under the lease, rental

agreement, or contract with the owner. "

9) The California Proposition 65 notification signs which building owners (excepting many or most government buildings) should have posted on your buildings cover many materials and substances, but they are not sufficient for notifying employees or contractors working on the building.

Contractor / Employer Registration / Licensing

An employer who will be engaging in asbestos-related work involving 100 square feet or more of surface area of asbestos-containing construction material must be registered with DOSH. Asbestos abatement contractors must have this registration in addition to a contractor's license, so they are typically used to perform such work. The square footage of ACCM to be disturbed is computed by adding up the surface area of all ACCMs which will be handled during the course of the work being performed by the employer, even if it is in noncontiguous locations in all of the buildings, structures, premises, fixtures, machinery or other areas which will be handled during the course of the work for which the employer has contracted, whether pursuant to single or multiple contracts with the same hirer. This generally means that a licensed asbestos abatement contractor must be utilized, unless a particular employer feels that they will have enough asbestos work that training and equipping some of their staff and becoming registered is cost effective.

If the work involves less than 100 sq. ft. of ACCM, the employer must send a simple "report of use" to Cal/OSHA. All other occupational health and safety work rule requirements apply-especially those from Title 8 of the California Code of Regulations, 1529. For more information about "reports of use" and the database of carcinogen use reports, call 415-703-5190. Also, see 8 CCR 5203, the Carcinogen Report of Use Requirements.

More information may be found on the DOSH web site.

OSHA Asbestos Regulations:

The federal OSHA asbestos regulations for the construction industry are contained in 29CFR1926.1101. The corresponding California regulations are at California Code of Regulations, Title 8 - Industrial Relations, Division 1- Industrial Relations, Chapter 4 - Division of Industrial Safety, Sub-chapter 4 - Construction Safety Orders, Article 4 - Dusts, Mists, Fumes, Vapors, and Gases, §§1529. Asbestos.

All of these OSHA regulations use the following definitions:

ACM is Asbestos Containing Material (also ACBM, which is Asbestos Containing Building material)

PACM is Presumed Asbestos Containing Material;

Surfacing Material is material that is sprayed, troweled-on or otherwise applied to surfaces, such as acoustical plaster on ceilings and fireproofing materials on structural members; and,

TSI is Thermal System Insulation (e.g. pipe and boiler insulation).

The California regulations mirror the federal OSHA regulations, and defines four classes of work on asbestos containing materials:

> "Class I asbestos work" means activities involving the removal of TSI and surfacing ACM and PACM.
>
> "Class II asbestos work" means activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastics.
>
> "Class III asbestos work" means repair and maintenance operations, where "ACM", including TSI and surfacing ACM and PACM, is likely to be disturbed. "Disturbance" means activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM and PACM, no greater than the amount which can be contained in one standard sized glove bag or waste bag in order to access a building component. In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or waste bag which shall not exceed 60 inches in length and width.
>
> "Class IV asbestos work" means maintenance and custodial activities during which employees contact but do not disturb ACM or PACM and activities to clean up dust, waste and debris resulting from Class I, II, and III activities.

The regulations require that all Class I, II and III asbestos work shall be conducted within regulated areas, with all of the related requirements for demarcation, signs, respirators, and so forth.

All asbestos work performed within regulated areas must be supervised by a competent person. A competent person for Class I and Class II work must be trained as an asbestos supervisor, as originally defined in the US EPA Asbestos Hazard Emergency Response Act (AHERA), 40 CFR 763 - available on the US EPA web site.

For Class III work, the competent person need only have the 16 hour training required for maintenance and custodial staff who disturb ACMs (also known as Operations & Maintenance or O&M training).

The OSHA regulations at 29CFR1926.1101(k)(9)(iii) require that training of workers for Class I operations and for Class II operations that require the use of critical barriers (or equivalent isolation methods) and/or negative pressure enclosures be the equivalent in curriculum, training method and length to the EPA Model Accreditation Plan (MAP) asbestos abatement workers training (40 CFR Part 763, subpart E, appendix C). However, 1926.1101(k)(9)(iv)(A) covering work with asbestos containing roofing materials, flooring materials, siding materials, ceiling tiles, or asbestos cement panels, allows a much shorter 8 hour training class for workers. That shorter class must include "hands-on" training and all the elements included in paragraph

(k)(9)(viii) of that section, plus the specific work practices and engineering controls set forth in paragraph (g) of that section which specifically relate to the category of work to be performed.

Many private training facilities provide the asbestos supervisor and worker initial and annual refresher training classes, as well as the O&M training classes. Unless it is reasonably certain that the supervisor and workers will never need to disturb more than the small amount of ACM allowed under Class III, they need the normal AHERA supervisor and worker classes.

Despite the small size of Class III projects, they must be conducted using engineering and work practice controls which minimize the exposure to employees performing the asbestos work and to bystander employees:

> (A) The work shall be performed using wet methods.
>
> (B) To the extent feasible, the work shall be performed using local exhaust ventilation.
>
> (C) Where the disturbance involves drilling, cutting, abrading, sanding, chipping, breaking, or sawing of thermal system insulation or surfacing material, the employer shall use impermeable drop cloths, and shall isolate the operation using mini-enclosures or glove bag systems or another isolation method.
>
> (D) Where the employer does not produce a "negative exposure assessment" for a job, or where monitoring results show the PEL (Permissible Exposure Limit) has been exceeded, the employer shall contain the area using impermeable drop cloths and plastic barriers or their equivalent, or shall isolate the operation using another listed and compliant control system.
>
> (E) Employees performing Class III jobs, which involve the disturbance of thermal system insulation or surfacing material, or where the employer does not produce a "negative exposure assessment" or where monitoring results show a PEL has been exceeded, shall wear respirators which are selected, used and fitted according to the applicable regulations.

Federal OSHA published a nice informal summary of their asbestos regulations for the construction industry, publication OSHA3096, Revised in 2002. It is available online.

<u>Materials Greater Than Zero, But Less Than 1% Asbestos</u>

Our extensive experience and that of the best consultants and laboratories in our industry over the past three decades indicates that most materials reported to contain less than1% asbestos by Polarized Light Microscopy (PLM) do contain asbestos, and many well over 1% asbestos. Unfortunately, too many other people, including many in the environmental consulting, abatement contracting, and other contracting industries, do not know this and do not know that work involving materials which contain less than one percent asbestos is still covered by numerous regulations.

Letters from the federal Occupational Safety and Health Administration (OSHA) interpreting their regulations make it clear that materials containing less than 1% asbestos are still covered

by significant portions of their asbestos regulations and that employers must exercise due diligence to avoid violations and exposures to asbestos. Some of those are:

A letter dated April 17, 1997 to Mr. Leon Petrakis states that the OSHA standard covers both "asbestos" and "asbestos-containing materials" and that “asbestos that is present in percentages less than one percent continues to be covered by the OSHA standard.”

A letter dated August 13, 1999 to Mr. Walter Chun regarding demolition (including during renovation) of materials containing less than one percent asbestos makes several key points:

- Unless the contractor produces an initial negative exposure assessment showing that neither asbestos Permissible Exposure Limit (PEL) will be exceeded, they must comply with the many elements of the standard that are applicable when either asbestos PEL is exceeded.

- Even if neither asbestos PEL is exceeded or might be exceeded, the use of wet methods and prompt clean-up and disposal of wastes and debris, as well as record keeping requirements associated with the negative exposure assessment, still apply.

- Employees who are working while the contractor seeks to produce a negative exposure assessment must be provided with the protective clothing described in 29 CFR 1926.1101(I), at least half-mask air-purifying respirators with high efficiency filters, and training that meets the mandates of 29 CFR 1926.1101(k)(9)(viii).

A letter dated February 1, 2005 to Mr. Skip Bolding indicates that removal of drywall is Class II work if any of the components of the drywall system (e.g. the drywall joint compound) contain more than 1% asbestos. It goes on to state that if none of the components contain more than 1% asbestos, the requirements depend on whether the employee exposures to airborne asbestos exceed either the 30-minute or 8-hour PELs. Even if neither PEL is exceeded, wet methods, prompt clean-up and disposal of wastes and debris contaminated with asbestos in leak-tight containers, and prohibitions against the use of high speed abrasive saws without HEPA-filtered exhaust, compressed air removal, and employee rotation to lower exposure still apply.

The California Code of Regulations, Title 8, Chapter 3.2. California Occupational Safety and Health Regulations (DOSH or CAL/OSHA), Subchapter 2. Regulations of the Division of Occupational Safety and Health, Article 2.5. Registration – Asbestos-Related Work, Sub-section 341.6. Registration Requirements, defines an Asbestos Containing Construction Material (ACCM) as any manufactured construction material which contains more than 1/10th of 1% (0.1%) asbestos by weight.

There are several issues:

1) The Polarized Light Microscopy (PLM) method commonly used really only has a resolution of about 1%.

2) The analytical method and laboratory accreditation people require that the laboratory report seeing asbestos in a sample, even if they do not see enough to feel comfortable calling it 1%. We have seen such samples which we have collected under a PLM microscope, and a sample prepared by the National Voluntary Laboratory Accreditation Program with 0.3% asbestos, and the asbestos was clearly visible in those samples.

3) Many of the materials contain binders and such which obscure the asbestos fibers, especially the finer fibers.

4) Materials such as stucco have an inconsistent asbestos content, as they were field mixed (We have met "old-timers"in the construction industry who told us that they used one coffee can of asbestos per mixer barrel of stucco).

5) Analysis by a Transmission Electron Microscope is the only proper method for additional analysis of non-friable materials, as PLM point counting is known to miss asbestos found by TEM analysis, and TEM analysis is essentially the same or lower cost than the far less accurate point counting. Please see the News section of our web site for an article on point counting. Due to the cost of additional analysis, few clients ever request anything beyond routine PLM analysis.

6) Both EPA and OSHA regulate asbestos, so the regulations of both, and corresponding state and local regulations, must be considered.

Materials Containing Less Than 10% Asbestos by PLM

The United States Environmental Protection Agency issued a document regarding materials found to contain less than 10% asbestos by Polarized Light Microscopy (PLM) on May 8, 1991 titled Applicability Determination Index Control Number: C112 which states:

> "If the amount by visual estimation appears to be less than 10 percent, the owner or operator may (1) assume the amount to be greater than 1 percent and treat the material as asbestos-containing material, or (2) require verification of the amount by point counting."

That document makes no mention of applicability only to friable materials, and we believe that is a typographical error.

The Asbestos Hazard Emergency Response Act signed by President Reagan in 1986 (AHERA, 40CFR Part 763, Subpart E) states that "point counting" is applicable to all bulk samples of ***friable insulation materials*** submitted for identification and quantitation of asbestos components.
We sent a letter to the Environmental protection Agency regarding this matter, and their response dated November 19, 2020 makes it clear that point counting is indeed applicable to ***friable materials.*** It the states:

> "Applicability Determination Index: Control Number C112 does not determine whether polarized light microscopy (PLM) point counting may be used to comply with the Asbestos National Emission Standards for Hazardous Air Pollutants

(NESHAP). That authority resides in the Asbestos NESHAP itself, see the definition for friable asbestos material at 40 CFR 61.141 and provided below:

> Friable asbestos material means any material containing more than 1 percent asbestos as determined using the method specified in appendix E, subpart E, 40 CFR part 763, section 1, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. If the asbestos content is less than 10 percent as determined by a method other than point counting by polarized light microscopy (PLM), verify the asbestos content by point counting using PLM."

Unless our client requests additional analysis by TEM (far superior to, ad less expensive than point counting), we assume that all friable materials reported to contain greater than zero, but less than 10% asbestos are Asbestos Containing Materials.

General Limitations

The conclusions presented in this report are professional opinions based on the indicated data described in this report. Opinions and recommendations presented herein apply to site conditions existing at the time of the site visit(s). Changes in the conditions of the property may occur with time due to natural processes or various activities on the subject property. Changes in applicable codes and standards may also occur as a result of legislation or the broadening of knowledge. Accordingly, this report may become invalid. This report is intended only for the client, purpose, location, and project indicated. The only persons or companies which may rely on it are our client, an abatement contractor hired by our client, and the client of our client when we are sub-consultants. All others may not rely upon this report without having a contract in place with us. We do not warrant that the information supplied to us by others is accurate.

Reports such as this prepared by any consultant are never intended to be definitive studies of the presence of asbestos and/or lead at the subject properties. Other locations of asbestos and/or lead may exist at the subject property, and the levels may vary from those stated in this report. There may be variations in the composition of materials which appear similar. Materials may be hidden from view and not accessible. This is especially so for occupied structures or structures where damage and invasive sampling need to be minimized (such as structures not owned by our client).

For pre-demolition surveys of vacant buildings, we do not hesitate to examine the structure in several areas, looking for multiple layers of materials and materials which are under other materials. We very, very rarely miss anything. However, we are performing surveys, not demolition work, so may not see things such as a patch of floor tile hidden under carpeting, and not detected by our typical examination of the area under the carpet at a corner(s) or existing hole(s). We examine the structure(s) in several locations, but do not pull up all of the carpet, or cut numerous holes in floors and walls. That would constitute demolition work, not survey work, and could also create contamination due to excessive disturbances of suspect materials.

Elevator brakes are not sampled, as they are the responsibility of the elevator maintenance firm only, and to avoid damage to the brake.

Location and sampling of underground items, such as asbestos-cement pipes, and sampling of sample asphalt, concrete, and gravel would have been outside of the scope of services for this project.

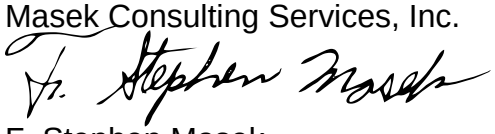
Company Background

Since 1991 we have provided services at many thousands of properties of all types. Our goals have always been to produce superior reports, offer superior value, and provide superior service. Significantly, about 33% of our revenue has been from sub-consulting work for medium and large consulting companies who demand top quality and choose to trust us to do work for their clients. Our clients include investors, architects, lenders, attorneys, government organizations, property management firms and other consulting firms. We provide a wide range of services needed for pre-acquisition due diligence of commercial properties and for management and correction of identified hazards or deficiencies. Please visit our web site for more information: http://www.masekconsulting.net

Consultant Background

The inspection and sampling portions of the survey and professional aspects of the report preparation were performed by Mr. F. Stephen Masek, author of the book Illustrated Practical Asbestos: For Consultants, Contractors, Property Managers & Regulators published in 2021. Mr. Masek has performed thousands of environmental inspections in all types of buildings. Mr. Masek has been a California Certified Asbestos Consultant since the certification program started in 1992, and has been an asbestos consultant since 1990. Mr. Masek became a California certified lead Inspector / Risk Assessor, Number 751, in 1993. He has extensive experience in related environmental services. He obtained a B.S.B.A. degree from Washington University in St. Louis (1980). He is a member of Mensa, the high IQ society. As an active member of ASTM, he has contributed to the revisions to the ASTM Phase I Environmental Site Assessment Standard, was chairman of an asbestos survey task group, and helped write portions of the ASTM Property Condition Assessment standard. He has written numerous magazine articles and has spoken at local, state, and national conventions. He also provides expert witness services.

Sincerely,
Masek Consulting Services, Inc.



F. Stephen Masek
President
California Certified Asbestos Consultant #92-0822, expires November 19 every year
E-Mail: stephenmasek@masekconsulting.net

Sketch and Laboratory Report Attachments

The attachments are important parts of this report.

The chain of custody form(s) is/are part of the laboratory report(s), and is/are one of the pages counted in the report(s).

Avoiding laboratory bias is done by minimizing the information provided to the laboratory. Therefore, we do not give information to the laboratory about which samples are or are not homogeneous, where they were collected, the full address of the building, and the name of the owner, as such information could be the cause of laboratory bias.

A sketch follows. We generally omit the prefix of the sample numbers from the sketch(es) or drawings for clarity. Such prefixes are used solely to prevent the laboratory from accidentally mixing samples from different batches.

The five page asbestos laboratory report, number 10064959, prepared by Scientific Analytical Institute, Inc. follows.

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and
40 CFR, Part 763, Subpart E, App.E

NVLAP LAB CODE 200664-0

Lab ID # 173190

Customer: Masek Consulting Services, Inc.
23478 Sandstone
Mission Viejo, CA 92692

Attn: Stephen Masek

Project: 800 Baker

Lab Order ID: **10064959**
Analysis: PLM
Date Received: 10/10/2024
Date Reported: 10/15/2024

Sample ID *Lab Sample ID*	Description *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes Treatment
800-1		None Detected		100% Other	White Non-Fibrous Homogeneous
10064959_0001					Dissolved
800-2		None Detected		100% Other	Gray Non-Fibrous Homogeneous
10064959_0002					Dissolved
800-3		None Detected		100% Other	White Non-Fibrous Homogeneous
10064959_0003					Dissolved
800-4		None Detected		100% Other	White Non-Fibrous Homogeneous
10064959_0004					Dissolved
800-5		None Detected		100% Other	White Non-Fibrous Homogeneous
10064959_0005					Dissolved
800-6		None Detected		100% Other	White Non-Fibrous Homogeneous
10064959_0006					Dissolved
800-7		None Detected		100% Other	Gray Non-Fibrous Homogeneous
10064959_0007					Dissolved
800-8		None Detected		100% Other	White Non-Fibrous Homogeneous
10064959_0008					Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommend that analysis of floor tiles, vermiculite, and/or heterogenous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Analytical uncertainty available upon request. Scientific Analytical Institute participates in the NVLAP Proficiency Testing program. Unless otherwise noted blank sample correction was not performed. Estimated MDL is 0.1%.

Patrick Yarnell (28)
Analyst

Nathaniel Durham
Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and
40 CFR, Part 763, Subpart E, App.E

NVLAP LAB CODE 200664-0

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Project: 800 Baker

Lab Order ID: **10064959**
Analysis: PLM
Date Received: 10/10/2024
Date Reported: 10/15/2024

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
800-9		**None Detected**		**100% Other**	White Non-Fibrous Homogeneous
10064959_0009					Dissolved
800-10		**None Detected**		**100% Other**	White Non-Fibrous Homogeneous
10064959_0010					Dissolved
800-11		**None Detected**		**100% Other**	Gray Non-Fibrous Homogeneous
10064959_0011					Dissolved
800-12		**None Detected**		**100% Other**	White Non-Fibrous Homogeneous
10064959_0012					Dissolved
800-13		**<1% Chrysotile**		**100% Other**	White Fibrous Homogeneous
10064959_0013					Dissolved
800-14		**<1% Chrysotile**		**100% Other**	Gray Fibrous Homogeneous
10064959_0014					Dissolved
800-15		**<1% Chrysotile**		**100% Other**	Tan Fibrous Homogeneous
10064959_0015					Dissolved
800-16		**None Detected**		**100% Other**	Gray Non-Fibrous Homogeneous
10064959_0016					Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommend that analysis of floor tiles, vermiculite, and/or heterogenous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Analytical uncertainty available upon request. Scientific Analytical Institute participates in the NVLAP Proficiency Testing program. Unless otherwise noted blank sample correction was not performed. Estimated MDL is 0.1%.

Patrick Yarnell (28)
Analyst

Nathaniel Durham
Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and
40 CFR, Part 763, Subpart E, App.E

NVLAP LAB CODE 200664-0

Lab ID # 173190

Customer: Masek Consulting Services, Inc.
23478 Sandstone
Mission Viejo, CA 92692

Attn: Stephen Masek

Project: 800 Baker

Lab Order ID: **10064959**
Analysis: PLM
Date Received: 10/10/2024
Date Reported: 10/15/2024

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
800-17		**None Detected**		**100% Other**	Tan Non-Fibrous Homogeneous
10064959_0017					Dissolved
800-18		**None Detected**		**100% Other**	White Non-Fibrous Homogeneous
10064959_0018					Dissolved
800-19		**None Detected**	**10% Synthetic Fibers**	**80% Other** **10% Quartz**	Black Fibrous Homogeneous
10064959_0019					Ashed
800-20		**None Detected**	**99% Cellulose**	**1% Other**	Tan Fibrous Homogeneous
10064959_0020					Teased
800-21		**None Detected**	**10% Synthetic Fibers**	**80% Other** **10% Quartz**	Black Fibrous Heterogeneous
10064959_0021					Dissolved
800-22		**None Detected**	**99% Cellulose**	**1% Other**	Tan Fibrous Homogeneous
10064959_0022					Teased
800-23		**<1% Chrysotile**		**100% Other**	Tan Fibrous Homogeneous
10064959_0023					Dissolved
800-24		**None Detected**		**100% Other**	Gray Non-Fibrous Homogeneous
10064959_0024					Dissolved

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Patrick Yarnell (28)
Analyst

Nathaniel Durham
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Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and
40 CFR, Part 763, Subpart E, App.E

NVLAP LAB CODE 200664-0

Lab ID # 173190

Customer: Masek Consulting Services, Inc.
23478 Sandstone
Mission Viejo, CA 92692

Attn: Stephen Masek

Project: 800 Baker

Lab Order ID: **10064959**
Analysis: PLM
Date Received: 10/10/2024
Date Reported: 10/15/2024

Sample ID *Lab Sample ID*	Description *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes Treatment
800-25		**None Detected**		**100% Other**	Gray, Black Non-Fibrous Homogeneous
10064959_0025					Ashed
800-26		**None Detected**		**100% Other**	Gray, Black Non-Fibrous Homogeneous
10064959_0026					Ashed
800-27		**None Detected**		**100% Other**	Black Non-Fibrous Homogeneous
10064959_0027					Dissolved
800-28		**None Detected**		**100% Other**	Black Non-Fibrous Homogeneous
10064959_0028					Dissolved

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Patrick Yarnell (28)
Analyst

Approved Signatory

10064959

Chain Of Custody To:	From: Masek Consulting Services, Inc.
Scientific Analytical Institute, Inc. 4604 Dundas Drive, Greensboro, NC 27407 SAI Fed-Ex: 2800 3394-4	23478 Sandstone St. Mission Viejo, CA 92692 Phone: (949) 581-8503 • http://www.masekconsulting.net SAI Client ID : MCS01

Project Name: 800 Baker

Enclosed are 28 samples

Numbered 800-1 to 800-28

First positive Stop on the following samples: N/A

☑ PLM ☐ TEM(AHERA / LEVEL II / bulk) ☐ Lead (1 ø wipe)

☐ Other: _____

Turnaround (from the day & hour the samples are received at the lab to the day and hour we receive the complete ***final*** report with ***all*** signatures):

☑ 3 Day ☐ 48 Hour ☐ 24 Hour ☐ 12 hour ☐ 6 hour

Only analyze the numbered materials listed on the sample bags.

E-mail the results *with the countersigned chain of custody* to
stephenmasek@masekconsulting.net

Samples collected and relinquished by F. Stephen Masek:

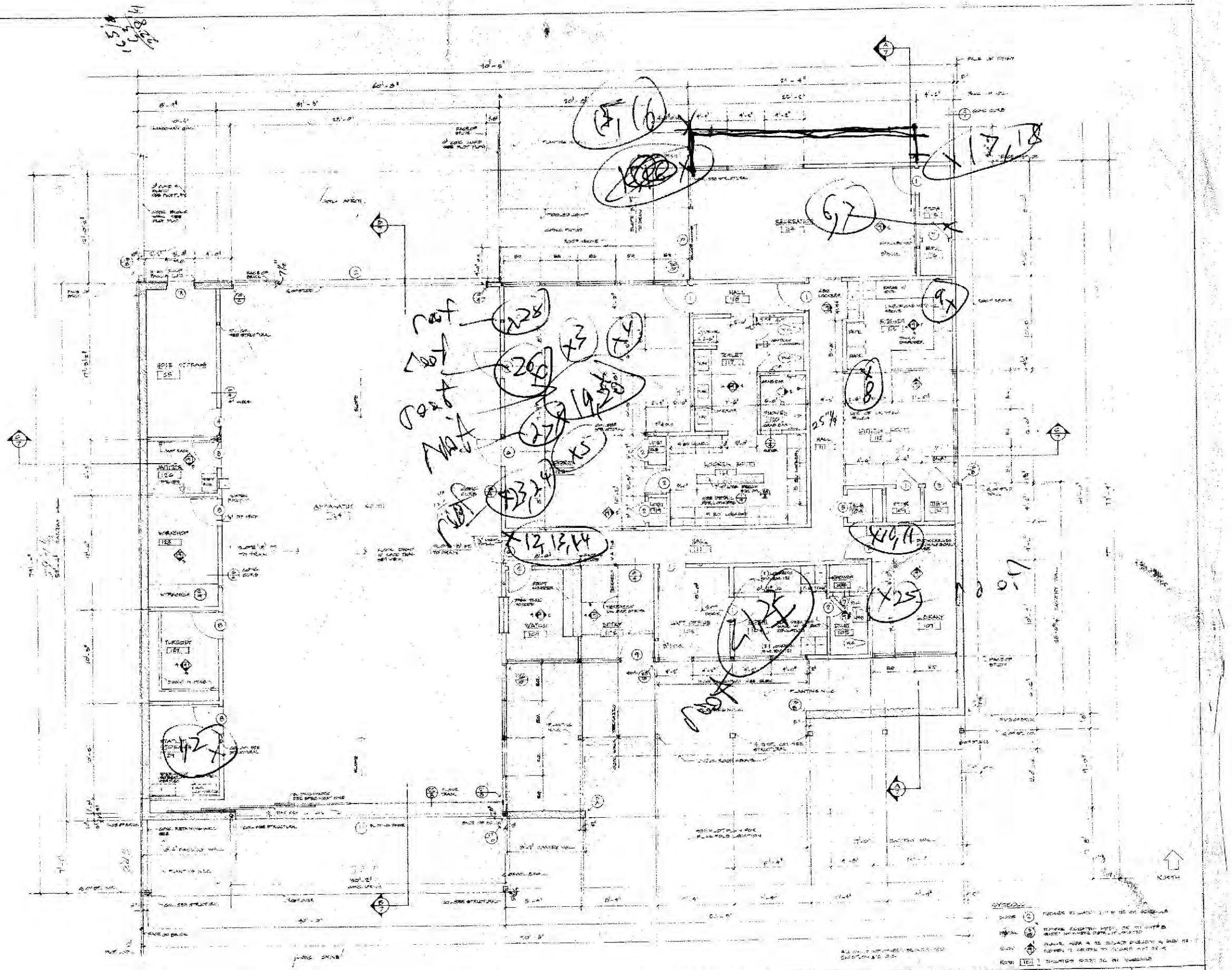
Date: 10/9/24 Signature: F. Stephen Masek

Lab - Received:

Date: 10/10 1030 Name: _____ Signature: _____

Accepted ☒

Rejected ☐



ARCHITECTS
SCHWAGER, DESATOFF & HENDERSON AIA
1800 ADAMS ST SUITE 304 P.O. BOX 1626 COSTA MESA PH. 646-8781

COSTA MESA FIRE STATION Nº 2
FOR
THE CITY OF COSTA MESA
COSTA MESA, CALIF
900 BAKER ST.

TITLE OF DRAWING
FLOOR PLAN

SCALE 1/2" = 1'-0"

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS ON THE JOB

REVISIONS

APPROVED BY
CHECKED BY
DRAWN BY

A-3
OF
19