

TECHNICAL SPECIFICATIONS

CITY OF PERRIS

SOUTH PERRIS FIRE STATION 105

**2495 Murrieta Road
PERRIS, CA 92585**

ARCHITECT

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ARCHITECTURE/PLANNING
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GEOTECHNICAL ENGINEER

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DIVISION	SECTION	TITLE
00		PROCUREMENT and CONTRACTING REQUIREMENTS
	00 3100	Available Project Information
01		GENERAL REQUIREMENTS
	01 2000	Contract Considerations
	01 3000	Administrative Requirements
	01 3114	Facility Services Coordination
	01 4200	Reference Standards and Definitions
	01 4500	Quality Control
	01 5000	Temporary Facilities
	01 5100	Temporary Utilities
	01 5713	Temporary Erosion Control
	01 5813	Temporary Project Sign
	01 6000	Product Requirements
	01 7000	Execution Requirements
	01 7419	Construction Waste Management and Disposal
	01 7800	Closeout Procedures
03		CONCRETE
	03 3000	Cast-in-Place Concrete
	03 3511	Concrete Floor Finishes
	03 3543	Polished Concrete
04		MASONRY
	04 0511	Mortar and Masonry Grout
	04 2000	Unit Masonry
	04 7300	Manufactured Stone Masonry
05		METAL
	05 5000	Metal Fabrications
06		WOOD, PLASTICS and COMPOSITES
	06 1000	Rough Carpentry
	06 1733	Wood I-Joists
	06 2000	Finish Carpentry
	06 4100	Architectural Wood Casework
	06 8316	Fiberglass Reinforced Paneling
07		THERMAL AND MOISTURE PROTECTION
	07 2100	Thermal Insulation
	07 2500	Weather Barriers
	07 4113	Metal Roof Panels
	07 4646	Fiber Cement Siding

DIVISION	SECTION	TITLE
	07 6200	Sheet Metal Flashing and Trim
	07 7100	Roof Specialties
	07 7123	Manufactured Gutters and Downspouts
	07 8400	Firestopping
	07 9200	Joint Sealants
08		OPENINGS
	08 1113	Hollow Metal Doors and Frames
	08 1416	Flush Wood Doors
	08 3100	Access Doors and Panels
	08 3323	Overhead Coiling Doors
	08 4113	Aluminum Framed Storefronts
	08 5313	Vinyl Windows
	08 6223	Tubular Skylights
	08 7100	Door Hardware
	08 8000	Glazing
	08 8300	Mirrors
	08 9100	Louvers
09		FINISHES
	09 2116	Gypsum Board Assemblies
	09 2400	Cement Plastering
	09 3000	Tiling
	09 5100	Suspended Acoustical Ceilings
	09 6519	Resilient Tile Flooring
	09 6566	Resilient Athletic Flooring
	09 6813	Tile Carpeting
	09 9113	Exterior Painting
	09 9123	Interior Painting
	09 9623	Anti-Graffiti Coating System
10		SPECIALTIES
	10 1400	Signage
	10 2600	Wall and Door Protection
	10 2800	Toilet and Bath Accessories
	10 4116	Rapid Entry Systems
	10 4400	Fire Protection Specialties
	10 5143	Turnout Gear Storage
	10 5500	Postal Specialties
	10 7500	Flagpoles
11		EQUIPMENT
	11 3013	Residential Appliances
	11 3100	Commercial Equipment
	11 6623	Gymnasium Equipment

DIVISION	SECTION	TITLE
12		FURNISHING
	12 2400	Window Shades
	12 3600	Countertops
	12 5800	Residential Furniture
13		SPECIAL CONSTRUCTION
	13 3420	Metal Building Systems (Carport)
21		FIRE SUPPRESSION
	21 1100	Facility Fire-Suppression Water-Service Piping
	21 1300	Fire Protection System
	21 1313	Wet Pipe Sprinkler Systems Fire Protection
22		PLUMBING
	22 0010	Basic Plumbing Requirements
	22 0517	Sleeves and Sleeve Seals for Plumbing Piping
	22 0518	Escutcheons for Plumbing Piping
	22 0523	General-Duty Valves for Plumbing Piping
	22 0529	Hangers and Supports for Plumbing Piping and Equipment
	22 0553	Identification for Plumbing Piping and Equipment
	22 0719	Plumbing Piping Insulation
	22 1005	Plumbing Piping
	22 1006	Plumbing Piping Specialties
	22 3000	Plumbing Equipment
	22 4000	Plumbing Fixtures
23		MECHANICAL
	23 0010	Basic Mechanical Requirements
	23 0529	Hangers and Support for HVAC Piping and Equipment
	23 0593	Testing, Adjusting, and Balancing for HVAC
	23 0713	Duct Insulation
	23 0719	HVAC Piping Insulation
	23 2300	Refrigerant Piping
	23 3100	HVAC Duct and Casings
	23 3300	Air Duct Accessories
	23 3423	HVAC Power Ventilators
	23 3700	Air Outlets and Inlets
	23 4000	HVAC Air Cleaning Devices
26		ELECTRICAL
	26 0010	Basic Electrical Requirements
	26 0519	Low-Voltage Electrical Power Conductors and Cables
	26 0526	Grounding and Bonding for Electrical Systems

DIVISION	SECTION	TITLE
	26 0529	Hangers and Supports for Electrical Systems
	26 0533.13	Conduit for Electrical Systems
	26 0533.16	Boxes for Electrical Systems
	26 0553	Identification for Electrical Systems
	26 0583	Wiring Connections
	26 0923	Lighting Control Devices
	26 2200	Low-Voltage Transformers
	26 2413	Switchboards
	26 2416	Panelboards
	26 2726	Wiring Devices
	26 2813	Fuses
	26 2816.16	Enclosed Switches
	26 3100	Photovoltaic Collectors
	26 3110	Battery Energy Storage System (BESS)
	26 3213	Engine Generators
	26 3600	Transfer Switches
	26 5100	Interior Lighting
	26 5600	Exterior Luminaires
27		COMMUNICATIONS
	27 1300	Communications-Backbone Cabling
	27 2020	Data and Voice Infrastructure
31		EARTHWORK
	31 1000	Site Clearing
	31 2200	Grading
	31 2316	Excavation
	31 2323	Fill and Backfill
32		EXTERIOR IMPROVEMENTS
	32 1216	Asphaltic Concrete Paving
	32 1313	Concrete Paving
	32 1713	Wheel Stops
	32 1723	Pavement Markings
	32 1726	Tactile Warning Surfacing
	32 3119	Decorative Metal Fences and Gates
	32 3313	Site Bicycle Racks
	32 8400	Landscape Irrigation
	32 9300	Trees, Plants and Ground Cover
33		UTILITIES
	33 0110.58	Disinfection of Water Utility Piping Systems
	33 1416	Site Water Utility Distribution Piping
	33 3113	Site Sanitary Sewerage Gravity Piping
	33 4211	Stormwater Gravity Piping
	33 4230	Stormwater Drains
	33 4923	Storm Drainage Water Retention Structures

DIVISION	SECTION	TITLE
	33 5613	Above Ground Fuel Storage Tanks
		APPENDIX A Geotechnical Report
		APPENDIX B Onsite Wastewater Treatment System Report
		APPENDIX C Gym/Exercise Equipment
		APPENDIX D Information Technology Equipment for Fire Station
		APPENDIX E Information Technology Equipment for Administration Building (Additive Alternate #1)

**SECTION 00 3100
AVAILABLE PROJECT INFORMATION**

PART 1 GENERAL

1.01 EXISTING CONDITIONS

- A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders as follows:
- B. Geotechnical Report: Entitled Geotechnical Investigation Project No. S168-196 - Proposed New Fire Station APN 327-210-016 prepared by Inland Foundation Engineering, Inc., dated September 23, 2025.
 - 1. Original copy is available for inspection with the project specifications, Appendix A.
 - 2. This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of Architect.
 - 3. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in Contract Documents.
 - 4. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Price accruing to Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

**SECTION 01 2000
CONTRACT CONSIDERATIONS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Schedule of Values.
- B. Application for Payment.
- C. Defect Assessment.
- D. Non-payment for Rejected Work.
- E. Change Procedures.

1.02 SCHEDULE OF VALUES

- A. Submit Schedule of Values for approval at Pre-Construction Meeting.
- B. Format: Submit typed schedule based upon the Schedule of Values
- 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.

1.03 APPLICATION FOR PAYMENT

- A. Submit two (2) copies of each Application on AIA Form G702 - "Application and Certificate for Payment".
- B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

1.04 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.

1.05 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.

1.06 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 the 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. Contractor will prepare and submit a detailed estimate within 5 days.

- C. 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.
- D. Stipulated Sum Change Order: Based on Proposal Request and Contractor's fixed price quotation or Contractor's Change Order Request as approved by Architect.
- E. 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.
- F. Change Order Forms: Of type provided by the Owner.
- G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- H. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item of work affected by the change and resubmit.
- I. 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.
- J. Promptly enter changes in Project Record Documents.

PART 2 PRODUCTS

2.01 -- NOT APPLICABLE --

PART 3 EXECUTION

3.01 -- NOT APPLICABLE--

END OF SECTION 01 20 00

**SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Preconstruction meeting.
- C. Site mobilization meeting.
- D. Progress meetings.
- E. Contractor's daily reports.
- F. Progress photographs.
- G. Coordination drawings.
- H. Submittals for review, information, and project closeout.
- I. Number of copies of submittals.
- J. Requests for Interpretation (RFI) procedures.
- K. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 01 6000 - PRODUCT REQUIREMENTS: General product requirements.
- B. Section 01 7000 - Execution Requirements: Additional coordination requirements.
- C. Section 01 7700 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 01 7000 - Execution Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Architect:
 - 1. Requests for Interpretation (RFI).
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 11. Closeout submittals.

1.04 PROJECT COORDINATOR

- A. Project Coordinator: Construction Manager.
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for worker access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 1000 - Summary.
- F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- G. Make the following types of submittals to Architect through the Project Coordinator:
 - 1. Requests for Interpretation.
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Manufacturer's instructions and field reports.
 - 5. Progress schedules.
 - 6. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 7. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via email.
 - 1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
 - 2. It is Contractor's responsibility to submit documents in allowable format.
 - 3. Paper document transmittals will not be reviewed; email electronic documents for review.
 - 4. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

3.02 PRECONSTRUCTION MEETING

- A. Owner will schedule a meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Contractor.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of subcontractors, schedule of values, and progress schedule.
 - 5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 6. Scheduling.
- D. Record minutes and distribute copies within 2 working days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 SITE MOBILIZATION MEETING

- A. Owner will schedule meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:
 - 1. Contractor.
 - 2. Owner.

3. Architect.
 4. Contractor's superintendent.
 5. Major subcontractors.
- C. Agenda:
1. Use of premises by Owner and Contractor.
 2. Owner's requirements.
 3. Construction facilities and controls provided by Owner.
 4. Temporary utilities provided by Owner.
 5. Survey and building layout.
 6. Security and housekeeping procedures.
 7. Schedules.
 8. Application for payment procedures.
 9. Procedures for testing.
 10. Procedures for maintaining record documents.
 11. Requirements for start-up of equipment.
 12. Inspection and acceptance of equipment put into service during construction period.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.
- B. Attendance Required:
1. Contractor.
 2. Architect.
 3. Contractor's superintendent.
 4. Major subcontractors.
- C. Agenda:
1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Review of RFIs log and status of responses.
 7. Maintenance of progress schedule.
 8. Corrective measures to regain projected schedules.
 9. Planned progress during succeeding work period.
 10. Maintenance of quality and work standards.
 11. Effect of proposed changes on progress schedule and coordination.
 12. Other business relating to work.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.05 CONSTRUCTION PROGRESS SCHEDULE

3.06 DAILY CONSTRUCTION REPORTS

- A. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
1. Date.
 2. High and low temperatures, and general weather conditions.
 3. List of subcontractors at Project site.
 4. Approximate count of personnel at Project site.
 5. Safety, environmental, or industrial relations incidents.

6. Meetings and significant decisions.
7. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
8. Directives and requests of Authority(s) Having Jurisdiction (AHJ).
9. Testing and/or inspections performed.
10. Signature of Contractor's authorized representative.
11. Services connected and disconnected.

3.07 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Photography Type: Digital; electronic files.
- C. Provide photographs of construction throughout progress of work produced by contractor's photographer, acceptable to Architect.
- D. In addition to periodic, recurring views, take photographs of each of the following events:
 1. Foundations in progress and upon completion.
 2. Structural framing in progress and upon completion.
- E. Views:
 1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
 2. Consult with Architect for instructions on views required.
 3. Provide factual presentation.
 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
- F. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
 1. Delivery Medium: Via email.
 2. File Naming: Include project identification, date and time of view, and view identification.
 3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
 4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.08 COORDINATION DRAWINGS

- A. Provide information required by Project Coordinator for preparation of coordination drawings.
- B. Review drawings prior to submission to Architect.

3.09 REQUESTS FOR INTERPRETATION (RFI)

- A. Definition: A request seeking one of the following:
 1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
- B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
 1. Prepare a separate RFI for each specific item.
 2. Prepare in a format and with content acceptable to Owner.
 3. Prepare using an electronic version of the form appended to this section.

- C. Review Time: Architect will respond and return RFIs to Contractor within 14 calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.

3.10 SUBMITTAL SCHEDULE

- A. Submit to Architect for review a schedule for submittals in tabular format.
 - 1. Coordinate with Contractor's construction schedule and schedule of values.

3.11 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 - 1. Product data.
 - 2. Shop drawings.
 - 3. Samples for selection.
 - 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.12 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Design data.
 - 2. Certificates.
 - 3. Test reports.
 - 4. Inspection reports.
 - 5. Manufacturer's instructions.
 - 6. Manufacturer's field reports.
 - 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.13 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.14 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.15 SUBMITTAL PROCEDURES

- A. General Requirements:
 - 1. Use a single transmittal for related items.
 - 2. Transmit using approved form.
 - a. Use Contractor's form, subject to prior approval by Architect.
 - 3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
 - 4. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
 - b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
- B. Product Data Procedures:
 - 1. Submit only information required by individual specification sections.
 - 2. Collect required information into a single submittal.
 - 3. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
 - 1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 - 2. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:
 - 1. Transmit related items together as single package.
 - 2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
 - 3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image.

3.16 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will not acknowledge receipt, and take no other action.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
 - 1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.
- D. Architect's and consultants' actions on items submitted for review:
 - 1. Final Unrestricted Release: When the Architect marks a submittal "No Exception Taken", the work covered by the submittal may proceed provided it complies with requirements of the Contract Documents.
 - 2. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "No Exception Taken".
 - b. "Make Corrections Noted", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - 3. Not Authorizing fabrication, delivery, and installation:
 - a. "Revise and Resubmit".
 - 1) Resubmit revised item, with review notations acknowledged and incorporated.
 - b. "Rejected".
 - 1) Submit item complying with requirements of Contract Documents.
- E. Architect's and consultants' actions on items submitted for information:

1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.
2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

**SECTION 01 3114
FACILITY SERVICES COORDINATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Services of a coordinator for facility services construction.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 - Administrative Requirements: Additional requirements for coordination.
- B. Section 01 6000 - PRODUCT REQUIREMENTS: Spare parts and maintenance materials.
- C. Section 01 7800 - Closeout Submittals: Project record documents.

1.03 MECHANICAL AND ELECTRICAL COORDINATOR

1.04 SUBMITTALS

- A. Submit name, address, and telephone number of coordinator and name of principal officer for review.
- B. Submit coordination drawings and schedules prior to submitting shop drawings, product data, and samples.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 COORDINATION REQUIRED

- A. Coordinate the work listed below:
 - 1. Fire Suppression: Division 21.
 - 2. Plumbing: Division 22.
 - 3. Heating, Ventilating, and Air Conditioning: Division 23.
 - 4. Electrical: Division 26.
 - 5. Communications: Division 27.
 - 6. Electronic Safety and Security: Division 28.
 - 7. Site Utilities: Division 33.
- B. Coordinate progress schedules, including dates for submittals and for delivery of products.
- C. Conduct meetings among subcontractors and others concerned, to establish and maintain coordination and schedules, and to resolve coordination matters in dispute.
- D. Participate in progress meetings. Report on progress of work to be adjusted under coordination requirements, and any required changes in schedules. Transmit minutes of meetings and reports to concerned parties.

3.02 COORDINATION OF SUBMITTALS

- A. Review shop drawings, product data, and samples for compliance with Contract Documents and for coordination with related work. Transmit copies of reviewed documents to Architect.

3.03 OBSERVATION OF WORK

- A. Observe work for compliance with Contract Documents.
- B. Maintain a list of observed deficiencies and defects; promptly submit.

3.04 DOCUMENTATION

- A. Observe and maintain a record of tests. Record:
 - 1. Name of Contractor, subcontractor, and _____.
 - 2. Name of testing agency and name of inspector.
 - 3. Date, time, and duration of tests.
- B. Submit copies of documentation to Architect upon request.

3.05 EQUIPMENT START-UP

- A. Verify utilities, connections, and controls are complete and equipment is in operable condition as required by Section 01 7000.

3.06 INSPECTION AND ACCEPTANCE OF EQUIPMENT

- A. Prior to inspection, verify that equipment is tested, operational, clean, and ready for operation.

END OF SECTION

**SECTION 01 4200
REFERENCE STANDARDS AND DEFINITIONS**

PART 1 GENERAL

1.01 REFERENCES

- A. The Contract Documents contain references to various standard specifications, codes, practices and requirements for materials, work quality, installation, inspections and tests, which references are published and issued by the organizations listed hereinafter by abbreviation and name. Such references are hereby made a part of these Contract Documents to the extent indicated or required.

1.02 DEFINITIONS

- A. General: Basic contract definitions are included in the General and Special Conditions of the Contract.
- B. "Indicated": The term "indicated" refers to graphic representations, notes or schedules on the Drawings; or to other paragraphs or schedules in the Specifications and similar requirements in the Contract Documents. Terms such as "shown", "noted", "scheduled" and "specified" are used to help the user locate the reference. Location is not limited.
- C. "Directed": Terms such as "directed", "requested", "authorized", "selected", "approved", "required" and "permitted" mean directed by the Architect, requested by the Architect, and similar phrases.
- D. "Approved": The term "approved", when used in conjunction with the Architect's action on the Contractor's submittals, applications and requests, is limited to the Architect's duties and responsibilities as stated in the General and Special Conditions of the Contract.
- E. "Regulations": The term "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.
- F. "Furnish": The term "furnish" means to supply and deliver to the project site, ready for unloading, unpacking, assembly, installation and similar operations.
- G. "Install": The term "install" describes operations at the project site including the actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.
- H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.
- I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor or contractor of lower tier, who performs a particular construction activity including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.
 - 1. The term "experienced", when used with the term "installer", means having successfully completed previous projects similar in size and scope to this project, being familiar with the specified requirements indicated; and having complied with requirements of authorities having jurisdiction.
 - 2. Trades: Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter". It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
 - 3. Assigning Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.

- a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.
- J. "Project Site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing work as part of the Project. The extent of the project site is shown on the drawings and may or may not be identical with the description of the land on which the Project is to be built.
- K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.03 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 2004 "Masterformat" numbering system.
- B. Specification Content: These Specifications use certain conventions for the style of language and the intended meaning of certain terms, words and phrases when used in particular situations. These conventions are as follows:
 - 1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate words 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 as the context of the Contract Documents indicates.
 - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.
 - a. The words "shall", "shall be" or "shall comply with", depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.04 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such Standards are made a part of the Contract Documents by reference.
- B. When the effective date of a Reference Standard is not given, it shall be understood that the current edition or latest revision thereof and any amendments or supplements thereto in effect on the date of issue of these Contract Documents, as indicated by the date on the cover sheet or in the Invitation to Bid, shall govern the work.
- C. Conflicting Requirements: Where compliance with 2 or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different but apparently equal to the Architect for a decision before proceeding.
 - 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on the Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source and make them available on request.
- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following list of general reference standards is common to the construction industry. This list is not all-inclusive nor does the presence of a reference standard imply necessarily that it is referenced in the Specifications or other Contract Documents.
- F. AA Aluminum Association
- G. AABC Associated Air Balance Council
- H. AAMA American Architectural Manufacturers Association
- I. AASHTO American Association of State Highway and Transportation Officials
- J. ACI American Concrete Institute International
- K. ADC American Diffusion Council
- L. AGA American Gas Association
- M. AIA American Institute of Architects
- N. AISC American Institute of Steel Construction
- O. AISI American Iron and Steel Institute
- P. ALSC American Lumber Standards Committee
- Q. AMCA Air Movement and Control Association International
- R. ANSI American National Standards Institute
- S. APA Engineered Wood Association (Formerly American Plywood Ass'n)
- T. ARI Air Conditioning and Refrigeration Institute
- U. ASCE American Society of Civil Engineers
- V. ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engrs
- W. ASME The American Society of Mechanical Engineers
- X. ASPE American Society of Plumbing Engineers
- Y. ASSE The American Society of Sanitary Engineers
- Z. ASTM American Society for Testing and Materials
- AA. AWI Architectural Woodwork Institute
- BB. AWS American Welding Society
- CC. BHMA Builders Hardware Manufacturers Association
- DD. BIA Brick Industry Association
- EE. Cisca Ceilings & Interior Systems Construction Association
- FF. CISPI Cast Iron Soil Pipe Institute
- GG. CLFMI Chain Link Fence Manufacturers Institute
- HH. CRSI Concrete Reinforcing Steel Institute
- II. DHI Door and Hardware Institute (Formerly Ntl. Builders Hardware Assoc)
- JJ. EIMA EIFS Industry Manufacturers Association
- KK. FGMA Flat Glass Marketing Association
- LL. FM Factory Mutual Research Corporation

MM.	GA	Gypsum Association
NN.	GANA	Glass Association of North America
OO.	IAPMO	International Association of Plumbing and Mechanical Officials
PP.	ICBO	International Conference of Building Officials
QQ.	ICC	International Code Council
RR.	IEEE	Institute of Electrical and Electronics Engineers
SS.	IESNA	Illuminating Engineering Society of North America
TT.	IGCC	Insulating Glass Certification Council
UU.	MBMA	Metal Building Manufacturers Association
VV.	NAAMM	The National Association of Architectural Metal Manufacturers
WW.	NCMA	National Concrete Masonry Association
XX.	NEBB	National Environmental Balancing Bureau
YY.	NECA	National Electrical Contractors Association
ZZ.	NEMA	National Electrical Manufacturers Association
AAA.	NETA	National Electrical Contractors Association
BBB.	NFPA	National Fire Protection Association
CCC.	NRCA	National Roofing Contractors Association
DDD.	NSF	NSF International (National Sanitation Foundation)
EEE.	PCA	Portland Cement Association
FFF.	PDI	Plumbing and Drainage Institute
GGG.	SDI	Steel Door Institute
HHH.	SGCC	Safety Glazing Certification Council
III.	SJI	Steel Joist Institute
JJJ.	SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
KKK.	TCA	Tile Council of America
LLL.	UBC	Uniform Building Code (International Conference of Building Officials)
MMM.	UL	Underwriters Laboratories, Inc.
NNN.	WCLIB	West Coast Lumber Inspection Bureau
OOO.	WDMA	Window and Door Manufacturers Association (Formerly NWWDA)
PPP.	WI	Woodwork Institute
QQQ.	Federal Government Agencies and Acronyms: Names and titles of Federal Government standards - or specification-producing agencies are often abbreviated. The following abbreviations and acronyms which may be referenced in the Contract Documents indicate names of standards - or specification-producing agencies of the Federal Government. This list is not all-inclusive nor does presence on the list imply necessarily that the abbreviation is referenced in the Specifications or other Contract Documents.	
RRR.	ADA	Americans with Disabilities Act
SSS.	CFR	Code of Federal Regulations
TTT.	COE	Corps of Engineers, U S Army
UUU.	CPSC	Consumer Product Safety Commission
VVV.	DOC	Department of Commerce

WWW.	DOT	Department of Transportation
XXX.	EPA	Environmental Protection Agency
YYY.	FAA	Federal Aviation Administration
ZZZ.	FCC	Federal Communications Commission
AAAA.	FDA	Food and Drug Administration
BBBB.	FHA	Federal Housing Administration
CCCC.	FS	Federal Specifications and Standards (General Services Admin)
DDDD.	GSA	General Services Administration
EEEE.	MIL	Military Specifications and Standards (U S Dept of Defense)
FFFF.	NIST	National Institute of Standards and Technology
GGGG.	OSHA	Occupational Safety and Health Administration (U S Dept of Labor)
HHHH.	PS	Product Standards (U S Dept of Commerce)
IIII.	USDA	United States Department of Agriculture
JJJJ.	USPS	United States Postal Service

PART 2 PRODUCTS

2.01 -- NOT APPLICABLE --

2.02

PART 3 EXECUTION

3.01 -- NOT APPLICABLE --

END OF SECTION 01 42 00

**SECTION 01 4500
QUALITY CONTROL**

PART 1 GENERAL

1.01 SUMMARY

- A. This section includes administrative and procedural requirements for quality-control services.
- B. Quality-Control services include inspections, tests and related actions, including reports performed and/or directed by the Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Architect.
- C. Inspection and testing services are required to verify compliance with requirements specified or indicated in the Construction Documents. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.

1.02 RESPONSIBILITIES

- A. Owner will employ and pay for services of an Independent Testing Laboratory to perform specified inspections and testing.
- B. Contractor Responsibilities:
 - 1. Deliver to laboratory at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the work, and to manufacturer's facilities.
 - 3. Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.
 - 4. Notify Architect/Engineer and laboratory 24 hours prior to expected time for operations requiring inspection and testing services.
 - a. Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide inspections, tests and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Costs for these services are included in the Contract Sum.
 - 1) Where individual sections specifically indicate that certain inspections, tests, and other quality-control services are the Contractor's responsibility, the Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services are included in the Contract Sum.
- C. Retesting: The Contractor is responsible for retesting where results of inspections, tests or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements.
 - 1. The cost of retesting construction, revised or replaced by the Contractor or Trade Subcontractor, is the Trade Subcontractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.
 - 2. Associated Services: Cooperate with agencies performing required inspections, tests and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
 - a. Provide security and protection of samples and test equipment at the project site.
- D. Duties of the Testing Agency: The Independent Agency engaged to perform inspections, sampling and testing of materials and construction specified in individual sections shall cooperate with the Architect and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.
 - 1. The agency shall notify the Architect and the Contractor promptly of irregularities or deficiencies observed in the work during performance of its services.
 - 2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents or approve or accept any portion of the work.

- E. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
 - 1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.
- F. Owner reserves the right to employ an Independent Testing agency at any time.

1.03 SUBMITTALS

- A. The Independent Testing Agency shall submit a certified written report, in duplicate, of each inspection, test or similar service to the Architect and Structural Engineer. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.
 - 1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
 - 2. Report Data: Written reports of each inspection, test or similar service include, but are not limited to, the following:
 - a. Date of issue.
 - b. Project title and number.
 - c. Name, address and telephone number of testing agency.
 - d. Dates and locations of samples and tests or inspections.
 - e. Names of individuals making the inspection or test.
 - f. Designation of the work and test method.
 - g. Identification of product and Specification Section.
 - h. Complete inspection or test data.
 - i. Test results and an interpretation of test results.
 - j. Ambient conditions at the time of sample taking and testing.
 - k. Comments or professional opinion on whether inspected or tested work complies with Contract Document requirements.
 - l. Name and signature of laboratory inspector.
 - m. Recommendations on retesting.

1.04 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as Reference Standards, comply with requirements of the Standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to Reference Standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of Standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties or responsibilities of the parties in contract nor those of Architect shall be altered from the Contract Documents by mention or inference in any reference document.

1.05 QUALITY ASSURANCE

- A. Qualifications of Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.

1. Each Independent Inspection and Testing Agency engaged on the project shall be authorized by authorities having jurisdiction to operate in the state where the project is located.
- 2.

PART 2 PRODUCTS

2.01 -- NOT APPLICABLE --

2.02

PART 3 EXECUTION

3.01 REPAIR AND PROTECTION

- A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Section 01 7000 - "Execution Requirements".
- B.
- C. Protect construction exposed by or for quality-control service activities, and protect repaired construction.
- D. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.
- E. Should manufacturer's instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes or specified requirements indicate higher standards or more precise workmanship.
- G. Have work performed by persons qualified to produce required and specified quality.
- H. Verify that field measurements are as indicated on Shop Drawings or and instructed by the manufacturer.
- I. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion and disfigurement.

3.02 MANUFACTURER'S FIELD SERVICES

- 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 as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

END OF SECTION 01 45 00

**SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary sanitary facilities.
- B. Temporary Controls: Barriers and enclosures.
- C. Exterior Enclosures.
- D. Vehicular access and parking.
- E. Waste removal facilities and services.

1.02 RELATED REQUIREMENTS

- A. Section 01 5100 - Temporary Utilities.

1.03 TEMPORARY FACILITIES LOCATION

- A. Designated locations of temporary facilities shall be determined at the preconstruction meeting.

1.04 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

1.05 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.07 VEHICULAR ACCESS AND PARKING - SEE SECTION 01 5500

- A. Coordinate access and haul routes with governing authorities and Owner.
- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide means of removing mud from vehicle wheels before entering streets.
- D. Designated existing on-site roads may be used for construction traffic.
- E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.08 WASTE REMOVAL

- A. See Section 017400 - Clean-up and disposal, for additional requirements.
- B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- C. Provide containers with lids. Remove trash from site periodically.

- D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

1.09 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 5100
TEMPORARY UTILITIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary Utilities: Provision of electricity, lighting, heat, ventilation, and water.

1.02 RELATED REQUIREMENTS

- A. Section 01 5000 - Temporary Facilities and Controls:
 - 1. Temporary telecommunications services for administrative purposes.
 - 2. Temporary sanitary facilities required by law.

1.03 TEMPORARY ELECTRICITY

- A. Cost: By Contractor.
- B. Complement existing power service capacity and characteristics as required.
- C. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.
- D. Provide main service disconnect and over-current protection at convenient location and meter.
- E. Permanent convenience receptacles may be utilized during construction.
- F. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain incandescent lighting for construction operations.
- 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.

1.05 TEMPORARY COOLING

- A. Cost of Energy: By Contractor.
- B. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.
- C. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.06 TEMPORARY VENTILATION

- A. Utilize existing ventilation equipment. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

1.07 TEMPORARY WATER SERVICE

- A. Cost of Water Used: By Contractor.
- B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.
- C. Connect to existing water source.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 5713
TEMPORARY EROSION CONTROL**

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 REFERENCE STANDARDS

- A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus; 2014.
- B. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 2017.
- C. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.; 1999a (Reapproved 2014).
- D. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2015.
- E. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a.
- F. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2016.

1.03 PERFORMANCE REQUIREMENTS

- A. Coordinate work of this section with Owner-provided "Storm Water Pollution Prevention Plan (SWPPP) if required by local enforcement agency.
 - 1. Where requirements of both plans are in conflict, comply with the SWPPP.
 - 2. SWPPP Plan not required if disturbed area is less than 1 acre.
- B. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
- C. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
- D. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- E. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
 - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
 - 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.
- F. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
 - 1. Control movement of sediment and soil from temporary stockpiles of soil.
 - 2. Prevent development of ruts due to equipment and vehicular traffic.

3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- G. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
 1. Prevent windblown soil from leaving the project site.
 2. Prevent tracking of mud onto public roads outside site.
 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- H. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- I. Open Water: Prevent standing water that could become stagnant.
- J. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.04 SUBMITTALS

- A. See Section 01 3000 - "Submittals", for submittal procedures.
- B. Erosion and Sedimentation Control Plan:
 1. Include:
 - a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
 - b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
 - c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
 - d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
 - e. Other information required by law.
 - f. Format required by law is acceptable, provided any additional information specified is also included.
 2. Obtain the approval of the Plan by authorities having jurisdiction.
 3. Obtain the approval of the Plan by Owner.
- C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Mulch: Use one of the following:
 1. Straw or hay.
 2. Wood waste, chips, or bark.
 3. Erosion control matting or netting.
 4. Polyethylene film, where specifically indicated only.
- B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

- C. Bales: Air dry, rectangular straw bales.
 - 1. Cross Section: 14 by 18 inches, minimum.
 - 2. Bindings: Wire or string, around long dimension.
- D. Bale Stakes: One of the following, minimum 3 feet long:
 - 1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot.
 - 2. Wood, 2 by 2 inches in cross section.
- E. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
 - 1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
 - 2. Permittivity: 0.05 sec^{-1} , minimum, when tested in accordance with ASTM D4491/D4491M.
 - 3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
 - 4. Tensile Strength: 100 pounds-force, minimum, in cross-machine direction; 124 pounds-force, minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
 - 5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
 - 6. Tear Strength: 55 pounds-force, minimum, when tested in accordance with ASTM D4533/D4533M.
 - 7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
 - 1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
 - 2. Straw bale row blocking entire inlet face area; anchor into pavement.
- C. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.
- D. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- E. Soil Stockpiles: Protect using one of the following measures:
 - 1. Cover with polyethylene film, secured by placing soil on outer edges.
- F. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
 - 1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.
- G. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 INSTALLATION

- A. Straw Bale Rows:

1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
 2. Install bales so that bindings are not in contact with the ground.
 3. Embed bales at least 4 inches in the ground.
 4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
 5. Fill gaps between ends of bales with loose straw wedged tightly.
 6. Place soil excavated for trench against bales on the upslope side of the row, compacted.
- B. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
 2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
 3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
 4. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
 5. Repeat irrigation as required until grass is established.

3.05 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Straw Bale Rows:
1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
 2. Remove silt deposits that exceed one-half of the height of the bales.
 3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

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

END OF SECTION 01 57 13

**SECTION 01 6000
PRODUCT REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Products
- B. Re-use of existing products.
- C. Transportation and handling.
- D. Storage and protection.
- E. Product options.
- F. Substitutions.

1.02 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. Products may also include existing materials or components required for reuse
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- C. Provide interchangeable components of the same manufacturer, for similar components.

1.03 TRANSPORTATION AND HANDLING

- A. Transport and handle Products in accordance with manufacturer's instructions
- B. Promptly inspect shipments to assure that Products comply with requirements, quantities are correct, and Products are undamaged.
- C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.04 STORAGE AND PROTECTION

- A. Store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.
- B. For exterior storage of fabricated products, place on sloped supports, above ground.
- C. Provide off-site storage and protection when site does not permit on-site storage or protection.
- D. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
- E. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- F.
- G. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- H. Arrange storage of Products to permit access for inspection. Periodically inspect to assure Products are undamaged and are maintained under specified conditions

1.05 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 a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

- C. Products specified by naming only one Manufacturer is intended to establish the standard required. It is not intended to limit the selection of equal products of other manufacturers.

1.06 SUBSTITUTIONS

- A. Architect/Engineer will consider requests for Substitutions only within 30 days after date of Owner Contractor Agreement.
- B. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.
- C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D. A request constitutes a representation that the Contractor:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Will provide the same warranty 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 complete with no additional cost to Owner
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
- E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- F. Substitution Submittal Procedure:
 - 1. Submit six copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
 - 2. Submit shop drawings, Product data, and certified test results attesting to the proposed product equivalence.
 - 3. The Architect/Engineer will notify Contractor, in writing, of decision to accept or reject request.
 - 4.

PART 2 PRODUCTS

EXISTING PRODUCTS

- A. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.
- B. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is encouraged.

PART 3 EXECUTION

-- NOT APPLICABLE --

END OF SECTION 01 60 00

**SECTION 01 7000
EXECUTION REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Pre-installation meetings.
- C. Cutting and patching.
- D. Surveying for laying out the work by the General Contractor.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Demonstration and instruction of Owner personnel.
- H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 - Submittals: Submittal procedures.
- B. Section 01 45 00 - Quality Control: Testing and inspection procedures.
- C. Section 01 5713 - Temporary Erosion Control: Additional erosion and sedimentation control requirements.
- D. Section 01 7419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- E. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties.
- F. Individual Product Specification Sections:
 - 1. Advance notification to other sections of openings required in work of those sections.
 - 2. Limitations on cutting structural members.

1.03 SUBMITTALS

- A. See Section 01 3000 - "Submittals", for submittal procedures.
- B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
 - 2. Identify demolition firm and submit qualifications.
 - 3. Include a summary of safety procedures.

1.04 QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
 - 1. Minimum of 5 years of documented experience.
- B. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.05 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water.
- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

- D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
- E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

1.06 COORDINATION

- A. Coordinate scheduling, submittals, and requirements of Section 01 30 00 - "Coordination" to ensure efficient and orderly sequence of installation of interdependent construction elements.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new 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.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. Coordinate completion and clean-up of work of separate sections.
- F. 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.
- G.

PART 2 PRODUCTS

2.01 -- NOT APPLICABLE --

2.02

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of 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. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.02 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.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Owner will locate and protect survey control and reference points.
- D. Control datum for survey is that established by Owner provided survey.
- E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- H. Utilize recognized engineering survey practices.
- I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
- B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- F. Make neat transitions between different surfaces, maintaining texture and appearance.
- G.

3.06 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove items indicated on drawings.
 - 2. Relocate items indicated on drawings.

3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. Provide temporary connections as required to maintain existing systems in service.
 4. Verify that abandoned services serve only abandoned facilities.
 5. Remove abandoned pipe, ducts, conduits, and equipment; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- D. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- E. Refinish existing surfaces as indicated:
 1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- F. Clean existing systems and equipment.
- G. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- H. Do not begin new construction in alterations areas before demolition is complete.
- I. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Employ experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- F. Restore work with new products in accordance with requirements of Contract Documents.

- G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- 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. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

- A. Coordinate with requirements of Section 01 9113 - General Commissioning Requirements.
- B. Coordinate schedule for start-up of various equipment and systems.
- C. Notify Architect and Owner seven days prior to start-up of each item.
- D. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- E. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

3.11 DEMONSTRATION AND INSTRUCTION

- A. See Section 01 7900 - Demonstration and Training.

3.12 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

- B. Testing, adjusting, and balancing HVAC systems: See Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

3.13 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- F. Clean site; sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect.
 - 2. Provide copies to Owner.
 - 3. Provide copies to Architect and Owner.
- B. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- C. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- D. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

3.15 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION 01 70 00

**SECTION 01 7419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
- E. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.
- F. The following sources may be useful in developing the Waste Management Plan:
 - 1. State Recycling Department, at calrecycle.ca.gov.
- G. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- H. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.

- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Waste Management Plan: Include the following information:
 - 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
 - 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
 - 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
 - 4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
 - 5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
 - 6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
- C. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 - 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - 2. Submit Report on a form acceptable to Owner.
 - 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - 4. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.

- d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
- 5. Material Reused on Project: Include the following information for each:
 - a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards.
 - c. Include weight tickets as evidence of quantity.
- 6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

- A. See Section 01 6000 - Product Requirements for substitution submission procedures.
- B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 6000:
 - 1. Relative amount of waste produced, compared to specified product.
 - 2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Price.
 - 3. Proposed disposal method for waste product.
 - 4. Markets for recycled waste product.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Prebid meeting.
 - 2. Preconstruction meeting.
 - 3. Regular job-site meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. Provide containers as required.
 - 2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

**SECTION 01 7800
CLOSEOUT PROCEDURES AND SUBMITTALS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:
 - 1. Inspection procedures for Completion Reviews.
 - 2. Final adjustments of accounts and payment.
 - 3. As-built drawings.
 - 4. Project record document submittal.
 - 5. Submittals and warranties.
 - 6. Final cleaning.
- B. Closeout requirements for specific construction activities are included in the appropriate individual sections.

1.02 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspections for certification of Substantial Completion, complete the following:
 - 1. Conduct inspection to substantiate basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or non-conforming work, reason for being incomplete, and date of anticipated completion for each item.
 - 2. Advise the Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
 - 4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates and similar releases.
 - 5. Submit record drawings, maintenance manuals, damage or settlement surveys, property surveys and similar final record information.
 - 6. Deliver tools, spare parts, extra stock and similar items.
 - 7. Make final changeover of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of changeover in security provisions.
 - 8. Complete startup testing of systems and instructions of the Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mockups, construction tools and similar elements.
 - 9. Complete final cleanup requirements, including touchup painting.
 - 10. Touch up and otherwise repair and restore marred, exposed finishes.

1.03 FINAL COMPLETION REVIEW

- A. Within 5 days after receipt of request for final review, Architect will make site review to determine whether Work is complete following procedures indicated in Conditions of the Contract.
- B. Should Architect consider Work to be incomplete or defective:
 - 1. Architect will promptly notify Contractor listing incomplete or defective work.
- C. Contractor shall take immediate steps to remedy stated deficiencies and send second written request to Architect the Work is complete.
 - 1. Architect will reinspect the Work.
 - 2. Revisits for Site Reviews:
 - a. Should Architect have to re-perform site reviews due to failure of work to comply with claims of completion made by Contractor, Owner will reimburse Architect for such

additional services and will deduct amount of compensation from final payment to Contractor.

1.04 EVIDENCE OF PAYMENTS AND RELEASE OF LIENS

- A. Submit Contractor's affidavit of Payment of Debts and Claims on AIA Document G706.
- B. Submit Contractor's affidavit of Release of Liens on AIA Document G706A with:
 - 1. Consent of Surety to Final Payment: AIA G707.
 - 2. Contractor's Release of Waiver of Liens.
 - 3. Separate releases or waivers of liens from subcontractors, suppliers and others with lien rights against property of Owner, together with list of those parties.
- C. Execute Submittals before delivery to Owner.

1.05 FINAL ADJUSTMENTS OF ACCOUNTS

- A. Submit final statement of accounting to Architect.
- B. Show adjustments to Contract Sum:
 - 1. Original Contract Sum.
 - 2. Additions and deductions resulting from:
 - a. Previous Change Orders.
 - b. Allowances.
 - c. Unit prices.
 - d. Deductions for uncorrected work.
 - e. Deductions for inspection payments.
 - f. Other adjustments.
 - 3. Total Contract Sum.
 - 4. Previous Payments.
 - 5. Retainage.
 - 6. Sum remaining due.
- C. Architect will prepare final Change Order reflecting approved adjustments to Contract Sum which are not included in Change Orders previously processed.

1.06 FINAL APPLICATION FOR PAYMENT

- A. Submit final Application for Payment in accordance with procedures and requirements stated in Conditions of the Contract.
- B.
- C.

1.07 RECORD DOCUMENT SUBMITTALS (AS-BUILTS)

- A. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings. Mark the set to show the actual installation where installation varies substantially from the work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
 - 1. Mark record sets with red ink. Use other colors to distinguish between variations in separate categories of the work.
 - 2. Mark new information that is important to the Owner but was not shown on Contract Drawings.
- B. Spare Parts and Extra Stock Inventory: Transmit spare parts and extra stock to the Owner with an inventory checklist for review by the Owner. Checklist shall include an itemized listing of each type of item and quantity, a method for the Owner to check off each item accepted, and a receipt for the Owner to sign and return to the Contractor accepting the entire inventory.
- C.

PART 2 PRODUCTS

2.01 -- NOT APPLICABLE --

2.02

PART 3 EXECUTION

3.01 CLOSEOUT PROCEDURES

- A. Operation and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Provide instructions by manufacturer's representatives if installers are not experienced in operation and maintenance procedures.
 - 1. Include a detailed review of the following items:
 - a. Maintenance manuals.
 - b. Record documents.
 - c. Spare parts and manuals.
 - d. Tools.
 - e. Lubricants.
 - f. Fuels.
 - g. Identification systems.
 - h. Control sequences.
 - i. Hazards.
 - j. Cleaning.
 - k. Warranties and bonds.
 - l. Maintenance agreements and similar continuing commitments.
 - 2. As part of the instructions for operating equipment, demonstrate the following procedures:
 - a. Startup.
 - b. Shutdown.
 - c. Emergency operations.
 - d. Noise and vibration adjustments.
 - e. Safety procedures.
 - f. Economy and efficiency adjustments.
 - g. Effective energy utilization.
- B. Delivery of Spare Parts and Extra Stock: Deliver spare parts and extra stock to storage location designated by the Owner.

3.02 FINAL CLEANING

- A. General: The General Conditions require general cleaning during construction. Regular site cleaning is included in Section 01 70 00 - "Execution Requirements".
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
- C. Removal of Protection: Remove temporary protection and facilities installed for protection of the work during construction.
- D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site as directed by the Owner.
 - 1. Where extra materials of value remain after completion of associated work, they become the Owner's property. Dispose of these materials as directed by the Owner.

END OF SECTION 01 77 00

**SECTION 03 3000
CAST-IN-PLACE CONCRETE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete formwork.
- B. Floors and slabs on grade.
- C. Concrete foundation walls.
- D. Concrete reinforcement.
- E. Joint devices associated with concrete work.
- F. Miscellaneous concrete elements, including equipment pads, light pole bases, flagpole bases, and thrust blocks.
- G. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.
- B. Section 32 1313 - Concrete Paving: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

- A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- C. ACI 301 - Specifications for Structural Concrete; 2016.
- D. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- F. ACI 305R - Guide to Hot Weather Concreting; 2010.
- G. ACI 306R - Guide to Cold Weather Concreting; 2016.
- H. ACI 308R - Guide to External Curing of Concrete; 2016.
- I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).
- J. ACI 347R - Guide to Formwork for Concrete; 2014, with Errata (2017).
- K. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018.
- L. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.
- M. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.
- N. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.
- O. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2018.
- P. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.
- Q. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.
- R. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

- S. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2016.
- T. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- U. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2015.
- V. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.
- W. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.
- X. ASTM E1155/E1155M - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers; 2023.
- Y. ASTM E1155M - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers (Metric); 2014.
- Z. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011 (Reapproved 2017).
- AA. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Mix Design: Submit proposed concrete mix design.
 - 1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
 - 2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
- C. Test Reports: Submit report for each test or series of tests specified.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 - 1. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.

2.02 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1. Type: Deformed billet-steel bars.
 - 2. Finish: Unfinished, unless otherwise indicated.
- B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
- C. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type II - Moderate Portland type.
 1. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
 1. Acquire aggregates for entire project from same source.
- C. Fly Ash: ASTM C618, Class C or F.
- D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

2.05 ACCESSORY MATERIALS

- A. Underslab Vapor Barrier shall have all of the following qualities:
 1. Maintain permeance of less than 0.01 Perms (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. Vapor barrier products:
 1. Basis of Design: Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC., (877) 464-7834 www.stegoindustries.com <<http://www.stegoindustries.com>>.
 - a. Approved Alternate: Vaporguard by Reef Industries, 713-507-4250. www.reefindustries.com <<http://www.reefindustries.com>>.
 - b. Approved Alternate: PMPC by WR Meadows, 800-342-5976. <<http://www.wrmeadows.com/pmpc/>>
 2. Accessory products:
 - a. Seam Tape
 - b. Perimeter/terminated edge seal
 - c. Penetration Prevention
 - d. Vapor Barrier-Safe Screed System
- C. Form Release Agent: Material which will not stain concrete or absorb moisture.
- D. Sealer:
 1. Westcoat Specialty Coating Systems, 770 Gateway Center Drive - San Diego, CA 92102. (800) 250-4519 / www.westcoat.com.
 - a. EC-95 Polyurethane Topcoat (use as sealer).
 - 1) Two (2) coats.
 2. Apply in strict conformance with manufacturer's instructions.
 3. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- E. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 1. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

2.06 BONDING AND JOINTING PRODUCTS

- A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
- B. Epoxy Bonding System:
 1. Complying with ASTM C881/C881M and of Type required for specific application.

- C. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
- D. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.

2.07 CURING MATERIALS

- A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
- B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
- C. Curing Agent, Water-Cure Equivalent Type: Clear, water-based, non-film-forming, liquid-water cure replacement agent.
 - 1. Comply with ASTM C309 standards for water retention.
 - 2. VOC Content: Zero.
- D. Moisture-Retaining Sheet: ASTM C171.
 - 1. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.
- E. Water: Potable, not detrimental to concrete.

2.08 CONCRETE MIX DESIGN

- A. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- C. Normal Weight Concrete:
 - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: as indicated on drawings.
 - a. Foundation and Slab on Fill Concrete:
 - 1) Apparatus bay slab (28 days): 4,500 psi.
 - 2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
 - 3. Water-Cement Ratio: Maximum as indicated on drawings percent by weight.
 - 4. Maximum Slump: as indicated on drawings inches.
 - 5. Maximum Aggregate Size: as indicated on drawings inch.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Verify that forms are clean and free of rust before applying release agent.
- C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in accordance with bonding agent manufacturer's instructions.
 - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
 - 2. Use latex bonding agent only for non-load-bearing applications.

- E. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
 - 1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Notify Architect not less than 24 hours prior to commencement of placement operations.
- C. Prepare base directly under concrete slabs smooth and compacted. No sharp gravel or protrusions permitted. Compacted sand over base is acceptable to smooth base prior to installation of vapor barrier. Sand or granular fill over vapor barrier is prohibited.
- D. No penetration of vapor barrier permitted.
- E. Prior to pouring, remove standing water by powered blower or other suitable means.
- F. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- G. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- H. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

3.05 CONCRETE FINISHING

- A. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
 - 1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include ceramic tile with full bed setting system.
 - 2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include resilient flooring, seamless flooring, and thin set ceramic tile.
 - 3. Decorative Exposed Surfaces: Trowel as described in ACI 302.1R; take measures necessary to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, pigmented concrete, surfaces to receive liquid hardeners, surfaces to receive dry-shake hardeners, surfaces to be polished, and all other exposed slab surfaces.
 - 4. Broom finish (medium) at exterior flatwork.
 - 5. Light broom finish at Apparatus Building.
- B. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

3.06 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.07 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
- E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.08 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.09 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

**SECTION 03 3511
CONCRETE FLOOR FINISHES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cleaning, application of liquid surface treatment and floor polish to specified finish and appearance level.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Prepared concrete floors ready to receive finish.
- B. Section 07 9200 - Joint Sealants.

1.03 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2012.
- B. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2007.
- C. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine; 2017.

1.04 QUALITY ASSURANCE

- A. Liquid Surface Treatment Applicator Qualifications:
 - 1. Provide letter of certification from liquid surface treatment manufacturer stating that the applicator is an approved applicator of the product, in good standing and is familiar with the proper manufacturer's procedures and installation requirements.
 - 2. Provide a list of a minimum of five (5) projects performed of similar type, size and complexity.
- B. The approved applicator shall provide proof of quantity of material used, and batch/lot numbers. Material shall be stored in accordance with the Manufacturer's instructions.
- C. Applicator Qualifications: Provide an adequate number of skilled workers who are trained and experienced in the necessary craft.
- D. Protection:
 - 1. The following is required to protect the floor slab from stains:
 - a. Inspect and Diaper all hydraulic powered equipment to avoid staining of the concrete.
 - b. Allow no trade to park vehicles on the inside slab. If necessary to complete their scope of work, place drop cloths under vehicles at all times.
 - c. Do not allow pipe cutting/threading machines to be used on the inside floor slab.
 - d. Do not allow steel placed on interior slab to cause rust stains.
 - e. Do not allow acids and acidic detergents to come into contact with slab.
 - f. Do not allow paint to come into contact with slab.
 - g. Ensure vehicles and equipment used on slabs have tires that will not leave marks.
 - 2. Ensure slab surface is protected from equipment scrapes, impact abrasions, etc. Repair damaged surface or remove slab panel as directed by Owner's Representative.
 - 3. General Contractor is to inform and enforce to all trades that the slab must be protected at all times.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations for the following:
 - 1. Liquid Surface Treatment
 - 2. Floor Finish.

- C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.06 PERFORMANCE REQUIREMENTS

- A. Minimum Static Coefficient of Friction (ASTM D2047):
 - 1. 0.60 (ADA Compliant).

1.07 MOCK-UP

- A. For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.
- B. Mock-Up Size: 10 feet square.
- C. Notify Architect 14 days prior to mock-up construction.
- D. Locate where directed.
- E. General Contractor is to maintain mock-ups during construction and will be used as a general reference to the finished product.
- F. Mock-up may not remain as part of the work.

1.08 PRE-INSTALLATION MEETING

- A. Convene one (1) week prior to starting work on concrete floors.
- B. Review preparation and installation procedures, coordinating and scheduling required with related work.
- C. All parties that influence the results of the polishing process must attend, including Polishing/Processing Installer, Flat Work Contractor, Owner, Architect, General Contractor and Parties responsible for assuring concrete mix design.
 - 1. Determine at what stage in construction floors are to be finished.
 - 2. Review how all parties are to work together and how each influences final results.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's sealed packaging, including application instructions.
- B. Dispense special concrete finish materials from factory numbered and sealed containers. Maintain record of batch/lot numbers.
- C. Submit record of batch/lot numbers to liquid surface treatment manufacturer for validation and issuance of warranties at the conclusion of the applications.

1.10 FIELD CONDITIONS

PART 2 PRODUCTS

2.01 MATERIALS AND MANUFACTURERS

- A. Indoor/Outdoor Concrete clear seal.
- B. Cure:
 - 1. Contractor may cure using a 7-day wet cure method, with the Aquacure curing blanket, by Greenstreak Industries, or approved equal.
 - 2. Use SilcoSeal Select bondbreaker, Nox-Crete Products Group, Inc. (800-NOX-CRETE), or approved equal.
 - a. Cure is to be removed using Bio-Clean in conjunction with floor scrubber.
- C. Scrubbing and Burnishing Machines: Equipment used for scrubbing and burnishing operations shall be Clark, Advance, Tenant, PowerBuff, Tornado or similar approved equal equipment as required to produce the specified results.
- D. Liquid Floor Cleaner:
 - 1. Bio-Clean, Nox-Crete Products Group, Inc. (800-NOX-CRETE). Or approved equal.
 - a. Refer to manufacturer's data sheet for specific instructions regarding correct dilution ratios, application techniques, and application rates.
- E. Liquid Surface Treatment:

1. Liquid Silicate.
 2. Products:
 - a. Duro-Nox LSC Lithium Silicate, Nox Crete Products Group, Inc., or approved equal.
- F. Floor Polish:
1. Synthetic Floor polish with stain blocker.
 - a. Duro-Polish Plus, Nox-Crete Products Group, Inc., or approved equal.

2.02 RELATED MATERIALS

- A. Water:
1. Potable.

PART 3 EXECUTION

3.01 FLOOR SLAB - GENERAL REQUIREMENTS AND SURFACE CONTITIONS

- A. The floor shall be cleaned immediately after the removal of the wet curing sheet to remove all residue, alkalis, etc. Do not permit the floor surface to dry between wet curing sheet removal and initial scrubbing.
- B. The General Contractor shall examine slab surface prior to starting work, with Liquid Surface Treatment Applicator present, for any conditions affecting the Applicator's ability to properly apply the liquid surface treatment. Do not proceed until unsatisfactory conditions are corrected.
- C. Verify via water test or other non-destructive test that no bond breakers, curing compounds or similar materials are present. If such materials are present, do not proceed with the work until they are removed.
- D. Prior to application, verify that floor surfaces are free of laitance.
- E. Coordinate with joint filling operations. Do not perform wet cleaning within 72 hours prior to joint filling.
- F. Utilize riding machine to the maximum extent practical to achieve optimum efficiency.

3.02 COATING APPLICATION

- A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.
- B. Verify that water vapor emission from concrete and relative humidity in concrete are within limits established by coating manufacturer.
- C. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.
- D. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.
- E. Floor Polish Application: Schedule to begin 10 days prior to installation of any equipment.
 1. Cleaning and Floor Preparation:
 - a. Double scrub floor with automatic scrubber with appropriate soft brushes or pads and specified floor cleaner to remove all latent salts and other residue.
 - b. Power rinse surface removing traces of any remaining residue.
 2. Floor Polish Application:
 - a. Apply polish in accordance with latest manufacturer's published instructions.
 - b. A test area shall be done and approved by the General Contractor prior to the entire area being treated.
 - c. Two (2) coats may be necessary to achieve desired results.

3.03 FLOOR FINISHING

- A. Gloss/Grit Finish.
1. First Floor only: 800 grit with a medium aggregate (salt and pepper look).

3.04 WORKMANSHIP AND CLEANING

- A. The premises shall be kept clean and free of debris at all times.
- B. Remove debris from jobsite.
 - 1. Dispose of materials in separate, closed containers in accordance with local regulations and per the Storm Water Protection Procedures Plan (SWPPP).

3.05 PROTECTION

- A. Protect finished work until fully cured in accordance with manufacturer's recommendations.

END OF SECTION

**SECTION 03 3543
POLISHED CONCRETE - PROSOCO**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Polished concrete system.
- B. Surface treatments for concrete floors and slabs.
- C. Densifiers and hardeners.
- D. Coatings.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Finishing of concrete surface; curing.
- B. Section 07 9200 - Joint Sealants.

1.03 REFERENCE STANDARDS

- A. ANSI/NFSI B101.1 - Test Method for Measuring the Wet SCOF of Hard-Surface Walkways; 2022.
- B. ANSI/NFSI B101.3 - Test Method For Measuring Wet DCOF Of Common Hard-Surface Floor Materials; 2012.
- C. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes; 2002 (Reapproved 2013).
- D. ASTM D4039 - Standard Test Method for Reflection Haze of High-Gloss Surfaces; 2009 (Reapproved 2023).
- E. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers; 2017.
- F. ASTM D5767 - Standard Test Method for Instrumental Measurement of Distinctness-of-Image (DOI) Gloss of Coated Surfaces; 2018 (Reapproved 2023).
- G. ASTM G154 - Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials; 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate work of this section with concrete floor placement and concrete floor curing.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.
- C. Product Data: Manufacturer's published data and installation instructions for concrete polishing system and finishing products, including manufacturer's installation instructions, information on compatibility of different products, and limitations.
- D. Product Data: Submit certification that products comply with regulations controlling use of volatile organic compounds.
- E. Installer's qualification statement.

1.06 QUALITY ASSURANCE

- A. Comply with national, state, and local VOC regulations.
- B. Installer Qualifications:
 - 1. Company specializing in installing products specified in this section, having completed minimum of five projects of similar size and complexity.
 - 2. Company is listed applicator of concrete finishes, having completed manufacturer's training program.

1.07 MOCK-UP

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.
- C. Mock-Up Size: 50 sq ft.
- D. Locate on site where directed.

1.08 FIELD CONDITIONS

- A. Ambient Conditions:
 - 1. Apply treatments and coatings when surface and air temperature is between 40 degrees F and 95 degrees F.
 - 2. Apply treatments and coatings when surface and air temperature is expected to remain above 40 degrees F for a minimum of eight hours after application.
 - 3. Maintain ambient temperature of 50 degrees F minimum.
 - 4. Apply treatments and coatings during calm wind conditions; provide adequate ventilation of enclosed or confined area.
 - 5. Apply treatments and coatings minimum 24 hours after rain exposure; suspend application when rain is anticipated within 8 hours of application.
 - 6. Do not apply to frozen substrate.

1.09 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 POLISHED CONCRETE SYSTEM

- A. Polished Concrete System: Materials, equipment, and procedures designed and furnished by a single manufacturer to produce dense polished concrete of the specified sheen.
 - 1. Manufacturer: PROSOCO, Inc; Consolideck Polished Concrete System: www.prosoco.com/consolideck/#sle.
 - 2. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 SURFACE TREATMENTS

- A. Cutting Aid: Clear, water-based blended surfactant treatment spray-applied to wet concrete.
 - 1. Product: PROSOCO, Inc; Consolideck First Cut: www.prosoco.com/consolideck/#sle.

2.03 DENSIFIERS AND HARDENERS

- A. Liquid Densifier and Hardener: Penetrating chemical compound, reacts with concrete, filling pores, hardening, and dustproofing.
 - 1. Composition: Lithium silicate.
 - 2. UV Stability: No degradation or yellowing when tested in accordance with ASTM G154.
 - 3. Product: PROSOCO, Inc; Consolideck LS: www.prosoco.com/consolideck/#sle.

2.04 COATINGS

- A. Coatings, General:
 - 1. Treated Material Slip Resistance: High traction range when tested according to ANSI/NFSI B101.1 and ANSI/NFSI B101.3.
 - 2. Stain Resistance: No adverse effect when tested according to ASTM D1308.
 - 3. UV Stability: No degradation or yellowing when tested according to ASTM G154.
- B. Clear Coating:
 - 1. High Gloss: Film forming protective treatment.
 - a. Composition: Lithium silicate.
 - b. Adhesion: Greater than 10 percent increase in pull off strength compared to untreated sample when tested according to ASTM D4541.

- c. Product: PROSOCO, Inc; Consolideck LSGuard:
www.prosoco.com/consolideck/#sle.
- 2. Medium Gloss: Film forming protective treatment.
 - a. Product: PROSOCO, Inc; Consolideck PolishGuard:
www.prosoco.com/consolideck/#sle.
- C. Penetrating Sealer:
 - 1. Low Gloss: Solvent-based penetrating clear protective treatment.
 - a. VOC Content: 100 g/L or less.
 - b. Product: PROSOCO, Inc; Consolideck Concrete Protector SB:
www.prosoco.com/consolideck/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that floor surfaces are clean and free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.
- B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes and allow complete curing before application of concrete hardener and densifier. See Section 07 9200.

3.02 GENERAL

- A. Apply materials in accordance with manufacturer's instructions.

3.03 PREPARATION

- A. Protect adjacent non-coated areas from drips, overflow, and overspray; avoid contact with metal, glass, and painted surfaces; immediately remove excess material.

3.04 CONCRETE POLISHING

- A. Grind and polish in multiple passes with each full pass in direction perpendicular to previous pass.
- B. Fill gaps, voids, and pop-outs during grinding operation.
- C. Apply densifier and hardener at specified rates and intervals.
- D. Final Polished Concrete Aggregate Exposure: Not to exceed CPC Class A - Cement Fines; cement fines, 85 to 95 percent; fine aggregates, 5 to 15 percent based on visual observation of overall area of polished floor versus Polished Concrete Aggregate Exposure Chart.
- E. Final Polished Concrete Appearance: CPC Level 4 - Highly Polished, image clarity value 70 to 100 percent with haze index less than 10.

3.05 PROTECTIVE TREATMENT

- A. Apply coatings in accordance with manufacturer's instructions. Match approved mock-ups for color, texture, sealing, and workmanship.
- B. Apply manufacturer's recommended protective treatment material to clean, dry slab after mechanically polishing.
 - 1. High gloss protective treatment:
 - 2. Medium gloss protective treatment:
 - 3. Low gloss protective treatment:
 - a. Allow to dry tack-free before burnishing slab surface in accordance with manufacturer's recommendations.
 - b. Repeat treatment up to two coats.
- C. Clean spills on slab surfaces immediately, with manufacturer's recommended chemicals and absorptive materials.
- D. No haze, white residue, streaking, or burnish marks permitted.

3.06 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Final Polished Concrete Appearance: Test image clarity value and haze index prior to application of sealer at a rate of three tests per 1000 sq ft of polished concrete.
 - 1. Image clarity: Test with Image Clarity Meter in accordance with ASTM D5767.
 - 2. Haze index: Test with Glossmeter in accordance with ASTM D4039.
 - 3. Match approved mock-ups for texture, appearance, and workmanship.

3.07 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

**SECTION 04 0511
MORTAR AND MASONRY GROUT**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Mortar for masonry.
- B. Grout for masonry.

1.02 RELATED REQUIREMENTS

- A. Section 01 4500 - Quality Control.
- B. Section 04 2000 - Unit Masonry System: Installation of mortar and grout.

1.03 REFERENCE STANDARDS

- A. ASTM C5 - Standard Specification for Quicklime for Structural Purposes; 2018.
- B. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2018.
- C. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.
- D. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
- E. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.
- F. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019.
- G. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2018.
- H. ASTM C476 - Standard Specification for Grout for Masonry; 2018.
- I. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2018a.
- J. ASTM C1019 - Standard Test Method for Sampling and Testing Grout; 2018.

1.04 SUBMITTALS

- A. See Section 01 3000 - "Submittals", for submittal procedures.
- B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.
- C. Samples: Submit two samples of mortar, illustrating mortar color and color range.
- D. Reports: Submit reports on mortar indicating compliance of mortar to property requirements of ASTM C270 and test and evaluation reports per ASTM C780.
- E. Reports: Submit reports on grout indicating conformance of component grout materials to requirements of ASTM C476 and test and evaluation reports to requirements of ASTM C 1019.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.06 FIELD CONDITIONS

- A. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry work.

1.07 MIX TEST

- A. Testing of Mortar Mix: In accordance with ASTM C780.
- B. Test mortar mix for compressive strength.
- C. Testing of Grout Mix: In accordance with ASTM C1019.
- D. Test grout mix for compressive strength.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT APPLICATIONS

- A. Mortar Mix Designs: ASTM C270, Property Specification.

2.02 MATERIALS

- A. Portland Cement: ASTM C150 , Type II - Moderate; standard gray color.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Quicklime: ASTM C5, non-hydraulic type.
- D. Mortar Aggregate: ASTM C144.
- E. Grout Aggregate: ASTM C404.
- F. Water: Clean and potable.

2.03 MORTAR MIXES

- A. Mortar for Reinforced Masonry: ASTM C270, utilizing the Proportion Method to achieve 1800 psi strength.

2.04 MORTAR MIXING

- A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.
- B. Maintain sand uniformly damp immediately before the mixing process.
- C. Do not use anti-freeze compounds to lower the freezing point of mortar.
- D. If water is lost by evaporation, re-temper only within two hours of mixing.
- E. Use mortar within two hours after mixing at temperatures of 80 degrees F, or 2-1/2 hours at temperatures under 50 degrees F.
- F.

2.05 GROUT MIXES

- A. Grout: 2000 psi strength at 28 days; 10 inches slump.

2.06 GROUT MIXING

- A. Mix grout in accordance with ASTM C94/C 94M.
- B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Request inspection of spaces to be grouted.

3.02 INSTALLATION

- A. Install mortar and grout to requirements of section(s) in which masonry is specified.
- B. Work grout into masonry cores and cavities to eliminate voids.
- C. Do not displace reinforcement while placing grout.
- D. Remove excess mortar from grout spaces.

3.03 GROUTING

- A. Use either high-lift or low-lift grouting techniques, at Contractor's option, subject to other limitations of Contract Documents.
- B. Low-Lift Grouting:
 - 1. Limit height of pours to 12 inches.
 - 2. Limit height of masonry to 16 inches above each pour.

3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
 4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.
- C. High-Lift Grouting:
1. Verify that horizontal and vertical reinforcement is in proper position and adequately secured before beginning pours.
 2. Place grout for spanning elements in single, continuous pour.

END OF SECTION 04 05 11

**SECTION 04 2000
UNIT MASONRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete block.
- B. Mortar and grout.
- C. Reinforcement and anchorage.

1.02 RELATED REQUIREMENTS

- A. Section 01 4500 - Quality Control
- B. Section 04 0511 - MORTAR AND Masonry GROUT.
- C. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

- A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018.
- B. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and mortar.
- C. Samples: Submit two samples of decorative block units to illustrate color, texture, and extremes of color range.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 inches long by 8 inches high and 8 inches wide.
 - a. Split face texture on both sides at perimeter site wall and precision finish at Trash Enclosure.
 - b. Site Walls: 16" x 8" x 12 inches Split face
 - c. Pilasters: 16" x 8" x 16" Split face units.
 - d. Wall Caps: 16" x 2" x 8" Precision.
 - e. Pilaster Caps: 16" x 2" x 16" Precision.
 - f. Color: To be selected by owner from manufacturer's standard color range.
 - 2. Manufacturer:
 - a. RCP Block Co.; www.rcpblock.com
 - b. Orco Block; www.orco.com.
 - c. Angelus Block; www.angelusblock.com.

3. Substitutions and Product Options: under provisions of Section 01 6000 - "Product Requirements".
- B. Special Shapes: Provide nonstandard blocks configured for corners.
- C. Load-Bearing Units: ASTM C90, medium weight.
 1. Grade N, Type 1-Moisture Controlled
 2. Hollow block, as indicated.
 3. Exposed Faces: Manufacturer's standard color and texture where indicated.

2.02 MORTAR AND GROUT MATERIALS

- A. Mortar and Grout: As specified in Section 04 0511.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: ASTM A615/A615M, deformed billet bars of yield strength indicated on the structural drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections 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.

3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 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. Concrete Masonry Units:
 1. Bond: Running.

3.04 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- C. Remove excess mortar and mortar smears as work progresses.
- D. Interlock intersections and external corners.
- E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.05 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.

3.06 BUILT-IN WORK

- A. As work progresses, install built-in fabricated metal frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.

3.07 TOLERANCES

- A. Maximum Variation From Unit to Adjacent Unit: 1/32 inch.
- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.08 CUTTING AND FITTING

- A. Cut and fit for pipes, conduit, and sleeves. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.09 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.10 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

**SECTION 04 7300
MANUFACTURED STONE MASONRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Adhered manufactured stone masonry veneer (AMSMV).
- B. Installation materials.
- C. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Wood stud backup for AMSMV; plywood and OSB sheathing.

1.03 REFERENCE STANDARDS

- A. ASTM C1670/C1670M - Standard Specification for Adhered Manufactured Stone Masonry Veneer Units; 2017.
- B. ASTM C1780 - Standard Practice for Installation Methods for Adhered Manufactured Stone Masonry Veneer; 2018a.
- C. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017.
- D. ASTM E2556/E2556M - Standard Specification for Vapor Permeable Flexible Sheet Water-Resistive Barriers Intended for Mechanical Attachment; 2010 (Reapproved 2016).
- E. ICC-ES AC51 - Acceptance Criteria for Precast Stone Veneer; 2016.
- F. NCMA (AMSV) - Installation Guide and Detailing Options for Compliance with ASTM C1780 for Adhered Manufactured Stone Veneer; Current Edition, Including All Revisions.
- G. MVMA (AMSV) - Installation Guide and Detailing Options for Compliance with ASTM C1780 For Adhered Manufactured Stone Veneer; 2018.
- H. NCMA TEK 20-01 - Key Installation Checkpoints for Manufactured Stone Veneer; 2014.
- I. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for AMSMV units, mortar, lath, and water-resistive barrier, including:
 - 1. Preparation instructions and recommendations.
- C. Verification Samples: For each finish product specified, two samples, minimum size 12 inches square, representing actual product, color, patterns and texture.
- D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum 3 years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified, with at least five years of documented experience.

1.06 MOCK-UP

- A. Construct mock-up panel 3 feet long by 4 feet high; include AMSMV, mortar, accessories, and substrate in mock-up.
- B. Locate where directed.

- C. Mock-up may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

1.08 FIELD CONDITIONS

- A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

1.09 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Adhered manufactured stone masonry veneer (AMSMV):
 - 1. Eldorado Stone: www.eldoradostone.com/#sle.
 - 2. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 ADHERED MANUFACTURED STONE MASONRY VENEER (AMSMV)

- A. AMSMV: Cast masonry units using a mixture of cement, lightweight aggregates, concrete additives and color pigments to replicate appearance of natural stone and designed to be applied with a cementitious mortar to a backing surface, complying with ASTM C1670/C1670M and ICC-ES AC51.
 - 1. Style: Limestone.
 - 2. Color, Texture, Range, Special Shapes: Grand Banks.
 - 3. Walls: Provide with single color and texture throughout.
- B. AMSMV Trim: Provide wall caps and corner stones.
 - 1. Where noted on drawings.

2.03 MORTAR APPLICATIONS

- A. At Contractor's option, mortar may be made from factory premixed dry materials with addition of water only or ready-mixed.
- B. Mortar Color: Natural gray unless otherwise indicated.
- C. Mortar Color: As selected by architect from standard range of colors.

2.04 MORTAR MIXES

- A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 - 1. Type: Type S.
 - 2. Color: Standard gray.
- B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

2.05 ACCESSORIES

- A. Water-Resistive Barrier: ASTM D226/D226M or ASTM E2556/E2556M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that backup wall system construction complies with AMSMV manufacturer's instructions, NCMA (AMSV), NCMA TEK 20-01, ASTM C1780 and ICC-ES AC51.

3.02 PREPARATION

- A. Clean all surfaces thoroughly prior to installation.
- B. Use manufacturer surface preparation recommendations to achieve best result.

3.03 INSTALLATION - AMSMV

- A. Install AMSMV with a cementitious mortar setting bed to a scratch coat backing surface, in accordance with AMSMV manufacturer's instructions, NCMA (AMSV), NCMA TEK 20-01, ASTM C1780 and ICC-ES AC51.
- B. Product should be pulled from a variety of boxes and blended on site during installation to ensure a consistent overall project color on the wall.
- C. Install in accordance with manufacturer's installation instructions. Visit this page for detailed installation instructions - <https://www.coronado.com/InstallationGuide>
- D. Mortar Joints: Raked.
- E. Caps: Install capstones where located on drawings.

3.04 INSTALLATION - MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

3.05 CONTROL AND EXPANSION JOINTS

- A. Form joints as detailed on drawings.

3.06 TOLERANCES

- A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
- C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.
- E. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

3.07 CUTTING AND FITTING

- A. Cut and fit for pipes and conduit. Coordinate with other sections of work to provide correct size, shape, and location.

3.08 CLEANING

- A. Remove excess mortar and mortar smears as work progresses.
- B. Replace defective mortar. Match adjacent work.
- C. Clean AMSMV in accordance with manufacturer's installation instructions.
 - 1. Installed manufactured stone veneer can be cleaned with a mild soap and water solution.
 - 2. Cleaning efflorescence can be done by lightly scrubbing the face of the stone with a soft bristle brush and water. In some cases, a 25% vinegar 75% water solution may need to be used. Do not use any harsh cleaning methods to remove efflorescence.

3.09 PROTECTION

- A. Protect finished work from rain during and for 48 hours following installation.
- B. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.
- C. Touch-up, repair or replace damaged stone before completion of project.
- D. Water repellents and enhancers can be used to further protect a finished project. Only breathable, penetrating water-based silane water repellents should be used.

END OF SECTION

**SECTION 05 5000
METAL FABRICATIONS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel, ferrous metal , aluminum, ferrous metal , and ferrous metal items.
- B. Grouting under base plates.

1.02 RELATED REQUIREMENTS

- A. Section 09 9113 - Exterior Painting: Paint finish.
- B. Section 09 9123 - Interior Painting: Paint finish.
- C. Section 32 3119 - Decorative Metal Fences and Gates.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
- F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014, with Editorial Revision (2017).
- G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.
- I. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2018.
- J. AWS A2.0 - Standard Welding Symbols.
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

1.04 SUBMITTALS

- A. See Section 01 3000 - "Submittals", for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
- C. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

1.05 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on Drawings.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.

- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
- F. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
- G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
- J. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C1107/C1107M and capable of developing a minimum compressive strength of 7,000 psi at 28 days.

2.02 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Sheet Aluminum: 3003-H14 alloy, H14, Mill finish.
 - 1. Perforated Metal: .0630 inch thick (14 gage)
- C. Bolts, Nuts, and Washers: Stainless steel.
- D. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.03 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds.
- 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.

2.04 FABRICATED ITEMS

- A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.
- B. Joist Hangers: Strap anchors, fabricated with sheet steel, 18 gauge, 0.0478 inch minimum base metal thickness; galvanized finish.
- C. Trash enclosure gates.
- D. Exterior Signage: Support frame, substrate.

2.05 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.

- E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.
- F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

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

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

3.05 SCHEDULE

- A. The Schedule is a list of principal items only. Refer to drawing details for items not specifically scheduled.
- B. Bollards: Stationary and removable. Steel pipe, concrete filled, crowned cap, as detailed; prime and paint finish.
- C. Metal fence panels and metal personnel gates, galvanized and powder coat.
- D. Metal Rolling Gate: galvanized and powder coated.
- E. Trash Enclosure Metal Canopy: galvanized.
- F. Trash Enclosure Gates: galvanized and painted.
- G. Fuel Tank / Generator Metal Canopy: galvanized and painted.
- H. Steel Awnings: galvanized and painted.
- I. Exterior Signage.

END OF SECTION 05 50 00

**SECTION 06 1000
ROUGH CARPENTRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural dimension lumber framing.
- B. Non-structural dimension lumber framing.
- C. Rough opening framing for doors, windows, and roof openings.
- D. Sheathing.
- E. Preservative treated wood materials.
- F. Miscellaneous framing and sheathing.
- G. Communications and electrical room mounting boards.
- H. Concealed wood blocking, nailers, and supports.
- I. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Setting anchors in concrete.
- B. Section 05 5000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
- C. Section 06 1733 - Wood I-Joists.
- D. Section 07 6200 - SHEET METAL FLASHING AND TRIM: Sill flashings.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
- C. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
- D. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2018a.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- F. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2015.
- G. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.
- H. PS 1 - Structural Plywood; 2009.
- I. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
- J. PS 20 - American Softwood Lumber Standard; 2015.
- K. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2015.
- L. WWP A G-5 - Western Lumber Grading Rules; 2017.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.

- C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Douglas Fir-Larch, unless otherwise indicated.
 - 2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
 - 3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Lumber from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.
- C. Stud Framing (2 by 2 through 2 by 6):
 - 1. Species: Douglas Fir-Larch.
 - 2. Grade: as indicated on structural drawings.
- D. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
 - 1. Species: Douglas Fir-Larch.
 - 2. Grade: as indicated on structural drawings.
- E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.

2.03 TIMBERS FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry (23 percent maximum).
- C. Beams and Posts 5 inches and over in thickness:
 - 1. Species: Douglas Fir-Larch.
 - 2. Grade: as indicated on Structural Drawings.

2.04 STRUCTURAL COMPOSITE LUMBER

- A. At Contractor's option, structural composite lumber may be substituted for concealed dimension lumber and timbers.
- B. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.

2.05 CONSTRUCTION PANELS

- A. Roof Sheathing: Oriented strand board wood structural panel; PS 2.
 - 1. Grade: Structural 1 Sheathing.
 - 2. Bond Classification: Exterior..
 - 3. Performance Category: 1/2 PERF CAT.
- B. Wall Sheathing: Oriented strand board wood structural panel; PS 2.
 - 1. Grade: Structural 1 Sheathing.

2. Bond Classification: Exterior.
 3. Performance Category: 15/32 Perf Cat.
 4. Span Rating: 24.
 5. Edges: Square.
- C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- D. Other Applications:
1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
 2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
 3. Other Locations: PS 1, C-D Plugged or better.

2.06 ACCESSORIES

- A. Fasteners and Anchors:
1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
- B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
- C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
- D. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.

2.07 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWWA standards.
- B. Preservative Treatment:
1. Preservative Pressure Treatment of Lumber Above Grade: AWWA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.01 PREPARATION

- A. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.
- B. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices unless otherwise specifically detailed.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AFPA Wood Frame Construction Manual.
- E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- E. Provide the following specific non-structural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Chalkboards and marker boards.
 - 8. Wall paneling and trim.
 - 9. Joints of rigid wall coverings that occur between studs.
 - 10. Signage
 - 11. Fans
 - 12. Light Fixtures

3.05 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.06 INSTALLATION OF CONSTRUCTION PANELS

- A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
 - 1. Nail panels to framing; staples are not permitted.
- B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.

- C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Size and Location: As indicated on drawings.
 - 3. Size and Location: As indicated on drawings.
 - 4. Where boards are indicated as full floor to ceiling height, install with long edge of board parallel to studs.

3.07 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.08 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.

3.09 CLEANING

- A. Waste Disposal: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

**SECTION 06 1733
WOOD I-JOISTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wood I-joists for roof and floor framing.
- B. Bridging, bracing, and anchorage.
- C. Framing for openings.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Installation requirements for miscellaneous framing.
- B. Section 06 1000 - Rough Carpentry: Material requirements for blocking, plates, and miscellaneous framing.

1.03 REFERENCE STANDARDS

- A. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a (Reapproved 2018).
- B. ASTM D5055 - Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists; 2016.
- C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.
- D. PS 1 - Structural Plywood; 2009.
- E. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's literature describing materials, dimensions, allowable spans and spacings, bearing and anchor details, bridging and bracing requirements, and installation instructions; identify independent inspection agency.
- C. Shop Drawings: Indicate sizes and spacing of joists, bracing and bridging, bearing stiffeners, holes to be cut (if any), and framed openings between joists.
- D. Certificate: Certification by joist manufacturer that products delivered are of the same design and construction as those evaluated by the independent inspection agency.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in manufacturer's original packaging with manufacturer's name and product identification intact and legible.
- B. Protect products from damage due to weather and breakage.
- C. Protect joists from warping or other distortion by stacking in upright position, braced to resist movement, with air circulation under coverings and around stacks.
- D. Handle individual joists in the upright position.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wood I-Joists:
 - 1. RedBuilt LLC; Redbuilt I-Joist: www.redbuilt.com/#sle.
 - 2. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 MATERIALS

- A. Wood I-Joists: Solid lumber top and bottom flanges and oriented strand board (OSB) webs bonded together with structural adhesive, with published span rating to meet project requirements.
 - 1. Span Rating: Established and monitored in accordance with ASTM D5055 by independent inspection agency.
 - 2. Oriented Strand Board: Comply with PS 2.
 - 3. Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.
 - 4. Fabrication Tolerances:
 - a. Flange Width: Plus/minus 1/32 inch.
 - b. Flange Thickness: Minus 1/16 inch.
 - c. Joist Depth: Plus 0, minus 1/8 inch.
 - 5. Marking: Mark each piece with depth, joist spacing, and allowable span for joist spacing.
- B. Wood-Based Components:
 - 1. Wood fabricated from old growth timber is not permitted.
- C. Joist Bridging: Type, size and spacing recommended by joist manufacturer.
- D. Wood Blocking, Plates, and Miscellaneous Framing: As specified in Section 06 1000.
- E. Fasteners: Electrogalvanized steel, type to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that supports and openings are ready to receive joists.
- B. Verify that field measurements are as indicated on shop drawings.

3.02 PREPARATION

- A. Coordinate placement of bearing items.

3.03 ERECTION

- A. Install joists in accordance with manufacturer's instructions.
- B. Set structural members level and plumb, in correct position.
- C. Make provisions for erection loads and for sufficient temporary bracing to maintain structure plumb and in true alignment until completion of erection and installation of permanent bracing.
- D. Do not field cut or alter structural members without approval of Architect.
- E. Install permanent bridging and bracing.
- F. Install headers and supports to frame openings required.
- G. Frame openings between joists with lumber in accordance with Section 06 1000.
- H. Coordinate installation of sheathing/decking with work of this section.

3.04 TOLERANCES

- A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION

**SECTION 06 2000
FINISH CARPENTRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Finish carpentry items other than shop prefabricated casework.
- B. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 06 4100 - Architectural Wood Casework Shop fabricated custom cabinet work.
- C. Section 08 1416 - Flush Wood Doors.
- D. Section 08 7100 - Door Hardware.
- E. Section 09 9113 - Exterior Painting: Painting of finish carpentry items.
- F. Section 09 9123 - Interior Painting: Painting of finish carpentry items.
- G. Section 10 2800 - Toilet, Bath and Laundry Accessories.

1.03 REFERENCE STANDARDS

- A. ANSI/HPHA HP - American Standard for Hardwood and Decorative Plywood.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
- C. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.
- D. FS MM-L-736 - Lumber; Hardwood.
- E. FS MMM-A-130 - Adhesive, Contact.

1.04 SUBMITTALS

- A. See Section 01 3000 - "Submittals" for submittal procedures.
- B. Product Data:
 - 1. Provide instructions for attachment hardware and finish hardware.
- C. Samples: Submit two samples of finish plywood, 4x4 inch in size illustrating wood grain and specified finish.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products under provisions of Section 01 6000 - "Product Requirements".
- B. Store materials in ventilated, interior locations under constant minimum temperatures of 60 degrees F and maximum relative humidity of 55 percent.
- C. Protect from moisture damage.

PART 2 PRODUCTS

2.01 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.02 LUMBER MATERIALS

- A. Softwood Lumber: PS 20; Custom Grade in accordance with WI (MAN). Douglas Fir Species, with flat grain, of quality capable of transparent finish.
- B. Hardwood Lumber: FS MM-L-736; Premium Grade in accordance with WI (MAN). Birch species, with flat grain, of quality capable of transparent finish.

2.03 SHEET MATERIALS

- A. Softwood Plywood: PS 1; Standard Sheathing Grade, Group 1, CD Appearance Quality; Douglas Fir species, with face veneer of rotary cut grain.

- B. Hardwood Plywood: ANSI/HPHA HP; Premium Grade in accordance with WI (MAN); veneer core material. Birch species, with face veneer of plain sliced grain.

2.04 PLASTIC LAMINATE MATERIALS

- A. Plastic Laminate: 0.050-inch General Purpose, manufactured by Formica, WilsonArt, or Nevamar.

2.05 ADHESIVE

- A. Adhesive: Type recommended by laminate manufacturer to suit application .
- B. Contact Adhesives: FS MMM-A-130; water base solvent release type.
- C. Wall Adhesive: Solvent release, cartridge type, compatible with wall substrate, capable of achieving durable bond.

2.06 ACCESSORIES

- A. Nails: Size and type to suit application, plain finish.
- B. Bolts, Nuts, Washers, Blind Fasteners, Lags and Screws: Size and type to suit application; plain finish.
- C. Lumber for Shimming and Blocking: Softwood lumber of Western White Pine species.
- D. Wood Filler: Solvent base, tinted to match surface finish color.

2.07 HARDWARE

- A. Hardware: Comply with BHMA A156.9.
- B. #255 shelf standards and #229 rests as manufactured by Knape & Vogt Manufacturing Company.

2.08 FABRICATION

- A. Fabricate to AWI/AWMAC/WI (AWS) Custom Standards.
- B. Shop prepare and identify components for book match grain matching during site erection.

2.09 SHOP FINISHING

- A. Shop finish work in accordance with AWI/AWMAC/WI (AWS) 'Factory Finishing', Section 5.
- B. Transparent Finish: AWI/AWMAC/WI (AWS) System Number 1; Premium.
- C. Opaque Finish: AWI/AWMAC/WI (AWS) System Number 7; Premium.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify that surfaces and openings are ready to receive work and field measurements are as shown on Shop Drawings and/or as instructed by the fabricator.
- C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.
- D. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

- A. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.03 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

- D. Install hardware supplied by Section 08 7100 - "Door Hardware" in accordance with manufacturer's instructions.
- E. Install Toilet and Bath accessories in accordance with manufacturer's instructions and as indicated on drawings.

3.04 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Site Finishing: See Section 09 9000 - "Painting and Coating".

3.05 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION 06 2000

**SECTION 06 4100
ARCHITECTURAL WOOD CASEWORK**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Specially fabricated cabinet units.
- B. Hardware.
- C. Factory finishing.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 12 3600 - Countertops.

1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).
- C. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- C. Product Data: Provide data for hardware accessories.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- B. Quality Certification:
 - 1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
 - 2. Provide designated labels on shop drawings as required by certification program.
 - 3. Provide designated labels on installed products as required by certification program.
 - 4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
 - 5. Replace, repair, or rework all work for which certification is refused.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

PART 2 PRODUCTS

2.01 CABINETS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Plastic Laminate Faced Cabinets: Custom Grade
 - 1. Finish - Exposed Interior Surfaces: Decorative laminate.
 - 2. Finish - Semi-Exposed Surfaces: Decorative laminate
 - 3. Finish - Concealed Surfaces: Manufacturer's option.

4. Door and Drawer Front Edge Profiles: Square edge with thin applied band.
5. Casework Construction Type: Type A - Frameless.
6. Adjustable Shelf Loading: 50 lbs. per sq. ft.
7. Cabinet Style: Flush overlay.
8. Cabinet Doors and Drawer Fronts: Flush style.

2.02 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.03 SHEET MATERIALS

- A. Medium Density Fiberboard (MDF); conforming to ANSI A208.
 1. At Plastic laminate cabinets.
 2. Drawer construction
 - a. Gables and Backs
 - b. Shelving
- B. Hardboard: PS 58; pressed wood fiber with resin binder, standard grade, smooth one side, locate as follows:
 1. Drawer Bottoms

2.04 LAMINATE MATERIALS

- A. Manufacturers:
 1. Formica Corporation; <>: www.formica.com.
 2. Panolam Industries International, Inc; Nevamar Hi-Wear: www.panolam.com/#sle.
 3. Wilsonart; <>: www.wilsonart.com.
 4. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- C. Provide specific types as indicated.
 1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, color as selected, finish as scheduled.
 2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, color as selected, finish as scheduled.
 3. Cabinet Liner: CLS, 0.020 inch nominal thickness, through color, white color, finish as scheduled.
 4. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

2.05 COUNTERTOPS

- A. Countertops are specified in Section 12 3600.

2.06 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Plastic Edge Banding: Extruded PVC, flat shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
 1. Edgeband thickness: 3mm
 2. Color: As selected by Architect from manufacturer's standard range.
- C. Fasteners: Size and type to suit application.
- D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- E. Grommets: Standard stainless steel grommets for cut-outs, in color as indicated.

2.07 HARDWARE

- A. Shelf Standards and Rests: Knappe and Vogt #255 and #256. Shelf Standards to be flush mounted (recessed).
- B. Drawer and Door Pulls: EPCO 4" solid brass cabinet wire pull, Brushed Chrome finish.
- C. Cabinet Locks: National 8123.
- D. Catches: Magnetic, 2 on doors over 42-inches high.
- E. Drawer Slides: ANSI/BHMA Standards, Grade 2. Acceptable Manufacturers: Accuride, Stanley, Grant.
- F. Pull-Out Shelf Slides: ANSI/BHMA Standards, Full extension, 100 lb rating, 322 Accuride or approved equal.
- G. Hinges (5-Knuckle): EBB-2-26D-03 Institutional Hinge.
- H. Continuous Hinge: Rockler #34943, Stainless steel 1-1/16"W x 72"L
- I. Wood Locker Combination Lock: CompX National DUAL Access, Keyless combination Cam Lock, www.compx.com.
- J. Wood Locker Padlock hasp: Padlockable cam lock, polished chrome. Standard shackle size 3/8" dia. Manf.-Olympus Lock, Inc. #DCP-26D
 - 1. Strike Plate (at pair doors): Timberline SP-257
 - 2. Elbow Catch(at pair doors): Epcoc E1018-26
- K. Wood Locker closet Rod: KV660, 1 1/16" Dia. (cut to length), with KV757 flange.
- L. Wood Locker Robe Hook: Double prong Polished Chrome finish
- M. Provide soft-closing dampers on all drawers and doors (Hafele or equal).
- N. Counter Bracket: A and M Hardware Inc.;www.aandmhhardware.com, Work Station Bracket, color-gray. Size suited for location.
- O. Lazy Susan: Rev-A-Shelf 6942-28-11-52, size 28"dia.
- P. Folding Shelf Bracket: Rockler 8" x 8" , steel, gray color. 110 lb weight rating
- Q. Substitutions and Product Options: Under provisions of Section 01 6000 - "Product Requirements"

2.08 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- C. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
- D. Apply cabinet liner, NEMA LD3, Grade CLS, at all cabinet interiors, shelving and drawersides. Color to be white. Shelves to be lined on both faces.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units.

- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- F. Secure cabinets to floor using appropriate angles and anchorages.
- G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

**SECTION 06 8316
FIBERGLASS REINFORCED PANELING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fiberglass reinforced plastic panels.
- B. Trim.

1.02 REFERENCE STANDARDS

- A. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2017.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Samples: Submit two samples 2 by 2 inch in size illustrating material and surface design of panels.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fiberglass Reinforced Plastic Panels:
 - 1. Marlite, Inc: www.marlite.com/#sle.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS

- A. Wall Panels:
 - 1. Panel Size: 4 by 8 feet.
 - 2. Panel Thickness: 0.10 inch.
 - 3. Surface Design: Embossed.
 - 4. Color: As selected by Architect. From standard range.
 - 5. Attachment Method: Adhesive only, sealant joints, no trim.

2.03 MATERIALS

- A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
 - 1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
- B. Trim: Vinyl; color coordinating with panel.
- C. Adhesive: Type recommended by panel manufacturer.
- D. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate flatness before starting work.
- B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

- A. Install panels in accordance with manufacturer's instructions.
- B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

- C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.
- D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.
- E. Install panels with manufacturer's recommended gap for panel field and corner joints.
- F. Place trim on panel before fastening edges, as required.
- G. Fill channels in trim with sealant before attaching to panel.
- H. Install trim with adhesive and screws or nails, as required.
- I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.
- J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

**SECTION 07 2100
THERMAL INSULATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.
- B. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.
- C. Sound Insulation

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Installation requirements for board insulation over steep slope roof sheathing or roof structure.

1.03 REFERENCE STANDARDS

- A. ASTM C165 - Standard Test Method for Measuring Compressive Properties of Thermal Insulations; 2007 (Reapproved 2017).
- B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.
- C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- E. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2016a.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.
- D. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- E. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of contractor accreditation and installer certification on project site during and after installation. Present on-site documentation upon request.

1.05 QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
 - 1. Installer Qualification: Use accredited contractors, certified installers, evaluated materials, and third-party field quality control audit.
 - 2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.
- B. Insulation in Wood Framed Walls: Batt insulation with no vapor retarder.

- C. Insulation Above Lay-In Acoustical Ceilings: Batt insulation with no vapor retarder.

2.02 MINERAL FIBER BLANKET INSULATION MATERIALS

- A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
1. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 2. Thermal Resistance:
 - a. R of 38 at underside of roof.
 - b. R of 30 at underside of roof at Apparatus Bay. Batt insulation with white scrim facing.
 - 1) Basis of Design: Bay Insulation, Lamtec WMP-VR-R-Plus, (Polypropylene/Scrim/Polyester).
 - c. R of 21 at exterior walls and where indicated in plans.
 3. Facing: Asphalt treated Kraft paper, one side.
 4. Products:
 - a. CertainTeed Corporation: www.certainteed.com.
 - b. Johns Manville: www.jm.com.
 - c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.owenscorning.com/en-us.
 - d. Bay Insulation of California. Fresno, CA, PH:559-268-6330.
 - e. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- B. Mineral Wool Blanket Sound Insulation: Flexible preformed insulation, complying with ASTM C167.
1. Soundproofing Insulation.
 2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 3. Thickness: 3 inch.
 4. Location: Interior walls.
 5. Products:
 - a. ROCKWOOL; Safe N Sound: www.rockwool.com/#sle.
 - b. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.03 ACCESSORIES

- A. Sill Plate Sealer: Closed-cell foam tape with rubberized adhesive membrane; bridges gap between foundation structure and sill plate or skirt board.
1. Width: 5-1/2 inches.
 2. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.
- B. Insulation Fasteners: Lengths of unfinished, 13-gauge, 0.072-inch high carbon spring steel with chisel or mitered tips, held in place by tension, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
- C. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
- D. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.
- E. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BATT INSTALLATION

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. Install with factory-applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.
- F. Staple or nail facing flanges in place at maximum 6 inches on center.
- G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
- H. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap and seal sheet retarder joints over face of member.
- I. Tape seal tears or cuts in vapor retarder.
- J. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.

3.03 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2500 WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Weather barrier membrane.
- B. Seam Tape.
- C. Flashing.
- D. Fasteners.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Vapor retarder under concrete slabs on grade.
- B. Section 06 1000 - Rough Carpentry: Water-resistive barrier under exterior cladding.
- C. Section 07 2100 - Thermal Insulation: Vapor retarder installed in conjunction with batt insulation.
- D. Section 07 4113 - Metal Roof Panels:
- E. Section 07 6200 - SHEET METAL FLASHING AND TRIM: Metal flashings installed in conjunction with weather barriers.
- F. Section 07 9200 - Joint Sealants: Sealing building expansion joints.
- G. Section 09 2400 - Portland Cement Plaster (Stucco): Weather barrier under exterior stucco.

1.03 REFERENCE STANDARDS

- A. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 2018.
- B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016.
- C. ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay; 2000, with Editorial Revision (2012).
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- F. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.
- G. ICC-ES AC308 - Acceptance Criteria for Water-Resistive Barriers; 2016.
- H. ICC-ES AC108 - Acceptance Criteria for Flexible Flashing Materials; 2017.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Samples: Weather Barrier Membrane, minimum 8-1/2" x 11".
- D. Quality Assurance Submittals:
 - 1. Design Data, Test Reports: Provide Manufacturer's test reports indicating product compliance with indicated requirements.
 - 2. Manufacturer's Instructions: Provide manufacturer's written installation instructions.
 - 3. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier assembly installation.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

- A. Water-Resistive Barrier: Provide on exterior walls under exterior cladding.
 - 1. Use building paper unless otherwise indicated.
 - 2. Under Portland cement stucco, use two separate layers of building paper.

2.02 WATER-RESISTIVE BARRIER MATERIALS (NEITHER AIR BARRIER OR VAPOR RETARDER)

- A. Building Paper: Asphalt-saturated Kraft building paper complying with requirements of ICC-ES AC308 Grade D.
 - 1. Water Penetration Resistance: Withstand a water head of 21 inches, minimum, for minimum of five hours, when tested in accordance with AATCC Test Method 127.
 - 2. Manufacturers:
 - a. Fortifiber Building Systems Group; Super Jumbo Tex 60 Minute:
www.fortifiber.com/#sle.
 - b. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.03 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.
- B. Flexible Flashing: Sheathing fabric saturated with vapor retarder coating and complying with the applicable requirements of ICC-ES AC148.
- C. Primers:
 - 1. Provide manufacturer recommended primer to assist in adhesion between substrate and flashing.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.
- C. Mechanically Fastened Sheets - On Exterior:
 - 1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
 - 2. Overlap seams as recommended by manufacturer but at least 6 inches.
 - 3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
 - 4. Install water-resistive barrier over jamb flashings.
 - 5. Install head flashings under weather barrier.
 - 6. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.
- D. Self-Adhered Sheets:
 - 1. Prepare substrate in manner recommended by sheet manufacturer; fill and tape joints in substrate and between dissimilar materials.
 - 2. Lap sheets shingle-fashion to shed water and seal laps air tight.
 - 3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that laps are firmly adhered with no gaps or fishmouths.
 - 4. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.
 - 5. At wide joints, provide extra flexible membrane allowing joint movement.

- E. Openings and Penetrations in Exterior Weather Barriers:
 - 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
 - 2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
 - 3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
 - 4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
 - 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
 - 6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Owner's Inspection and Testing: Cooperate with Owner's testing agency.
 - 1. Allow access to work areas and staging.
 - 2. Notify Owner's testing agency in writing of schedule for work of this section to allow sufficient time for testing and inspection.
 - 3. Do not cover work of this section until testing and inspection is accepted.
- C. Coordination of ABAA Tests and Inspections:
 - 1. Provide testing and inspection required by ABAA QAP.
 - 2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
 - 3. Cooperate with ABAA testing agency.
 - 4. Allow access to air barrier work areas and staging.
 - 5. Do not cover air barrier work until tested, inspected, and accepted.
- D. Do not cover installed weather barriers until required inspections have been completed.
- E. Notify manufacturer's designated representative to obtain periodic observations of weather barrier assembly installation.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.
- B. Protect installed weather barrier from damage.

END OF SECTION

**SECTION 07 4113
METAL ROOF PANELS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal roof panel system of preformed steel panels.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Roof sheathing.
- B. Section 07 9200 - Joint Sealants: Sealing joints between metal roof panel system and adjacent construction.

1.03 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
- C. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).
- D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- E. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2018.
- F. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; 2005 (Reapproved 2017).
- G. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Storage and handling requirements and recommendations.
 - 2. Installation methods.
 - 3. Specimen warranty.
- C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
 - 1. Show work to be field-fabricated or field-assembled.
- D. Test Reports: Indicate compliance of metal roofing system to specified requirements.
- E. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section and with at least three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.

- B. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.
- C. Special Warranty: Provide 2-year warranty for weathertightness of roofing system, including agreement to repair or replace metal roof panels that fail to keep out water commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Architectural Metal Roof Panel Manufacturers:
 - 1. Taylor Metal Products: 4880 Felspar St, Riverside, CA 92509: www.taylormetal.com, Ph: 877.504.1594.
 - a. Basis of Design: Clip-Lock, 24 gauge, Striations, Standing Seam System.
 - 2. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 PERFORMANCE REQUIREMENTS

- A. Metal Roof Panels: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for compliance with the following minimum standards:
 - 1. Structural Design Criteria: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed L/180 of span length(L) when tested in accordance with ASTM E1592.
 - 2. Overall: Complete weathertight system tested and approved in accordance with ASTM E1592.
 - 3. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.

2.03 METAL ROOF PANELS

- A. Metal Roof Panels: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.
- B. Metal Panels: Factory-formed panels with factory-applied finish.
 - 1. Steel Panels:
 - a. Zinc-coated steel complying with ASTM A653/A653M; minimum G60 galvanizing.
 - b. Steel Thickness: Minimum 24 gauge, 0.024 inch.
 - 2. Profile: Standing seam, with minimum 3 inch seam height; concealed fastener system lapped seam in standing seam profile.
 - 3. Texture: Smooth.
 - 4. Width: Maximum panel coverage of 24 inches.

2.04 ATTACHMENT SYSTEM

- A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.05 FINISHES

- A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film

thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer's standard line.

2.06 ACCESSORIES

- A. Miscellaneous Sheet Metal Items: Provide flashings, gutters, downspouts, trim, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.
- B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.
- C. Sealants:
 - 1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
 - 2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
- D. Underlayment: Self-adhering polymer modified asphalt sheet complying with ASTM D1970/D1970M, with strippable release film and top surface of woven polypropylene sheet.
 - 1. Sheet Thickness: 22 mil, 0.022 inch minimum total thickness.
 - 2. Products:
 - a. Polyglass USA, Inc; Polystick MTS Self-Adhered High Temperature Roof Underlayment: www.polyglass.us/#sle.
 - b. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to ensure that completed roof will be free of leaks.
- B. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by metal roof panel manufacturer.
- C. At locations where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.03 INSTALLATION

- A. Overall: Install roofing system in accordance with approved shop drawings and metal roof panel manufacturer's instructions and recommendations, as applicable to specific project conditions; securely anchor components of roofing system in place allowing for thermal and structural movement.
 - 1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
 - 2. Minimize field cutting of panels. Where field cutting is required, use methods that will not distort panel profiles. Use of torches for field cutting is prohibited.
- B. Accessories: Install necessary components that are required for complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.
- C. Roof Panels: Install metal roof panels in accordance with manufacturer's installation instructions, minimizing transverse joints except at junction with penetrations.

3.04 CLEANING

- A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.05 PROTECTION

- A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.
- B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION

**SECTION 07 4646
FIBER-CEMENT SIDING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fiber-cement siding.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Siding substrate.
- B. Section 07 2500 - Weather Barriers: Weather barrier under siding.
- C. Section 07 9200 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

1.03 REFERENCE STANDARDS

- A. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets; 2008 (Reapproved 2016).

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
 - 1. Manufacturer's requirements for related materials to be installed by others.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods, including nail patterns.
- C. Manufacturer's qualification statement.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Deliver and store materials in manufacturer's unopened packaging, with labels intact, until ready for installation.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer warranty for years as indicated under Fiber-Cement Siding article sub-headings for "Warranty". Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 FIBER-CEMENT SIDING

- A. Lap Siding: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
 - 1. Style: Standard lap style.
 - 2. Texture: Simulated cedar grain.
 - 3. Thickness: 5/16 inch, nominal.
 - 4. Finish: Factory applied topcoat.
 - 5. Color: As selected by Architect from manufacturers full range of available colors.

6. Manufacturers:

a. James Hardie Building Products, Inc: www.jameshardie.com/#sle.

1) Hardie Plank

2.02 ACCESSORIES

- A. Furring Strips: Galvanized metal channels.
- B. Furring Strips, Plastic: Mold resistant, non-absorptive entangled polymer that promotes drainage and cross ventilation.
- C. Trim: Same material and texture as siding.
- D. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch.
- E. Exterior Soffit Vents: One piece, perforated, ASTM B221 (ASTM B221M) 6063 alloy T5 temper aluminum, with edge suitable for direct application to gypsum board and manufactured especially for soffit application, and provide continuous vent.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.
- B. Verify that water-resistive barrier has been installed over substrate completely and correctly.
- C. Do not begin until unacceptable conditions have been corrected.
- D. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Protect surrounding areas and adjacent surfaces during execution of this work.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and recommendations.
 - 1. Read warranty and comply with terms necessary to maintain warranty coverage.
 - 2. Touch up field cut edges before installing.
 - 3. Pre-drill nail holes if necessary to prevent breakage.
- B. Over Wood Studs without Sheathing: Install siding over weather-resistive barrier, fastened into studs.
- C. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.
- D. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.
- E. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.
- F. Do not install siding less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.
- G. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.

3.04 CLEANING

- A. See Section 01 7000 - Execution Requirements for additional requirements.
- B. Clean faced panels in accordance with manufacturer's maintenance instructions, using cleaning materials and methods acceptable to manufacturer.

3.05 PROTECTION

- A. Protect installed products until Date of Substantial Completion.

STK Architecture, Inc.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

**SECTION 07 6200
SHEET METAL FLASHING AND TRIM**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Coping.
- B. Roof flashings.
- C. Counter-flashings over base flashings.
- D. Counter-flashings at roof mounted mechanical equipment and vent stacks.

1.02 RELATED WORK

- A. Section 07 9200 - Joint Sealers.

1.03 REFERENCE STANDARDS

- A. ASTM A525 - Steel Sheet, Zinc Coated, (Galvanized) by the Hot-Dip Process
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- D. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017.
- E. FS O-F-506 - Flux, Soldering, Paste and Liquid.
- F. FS QQ-S-571 - Solder, Tin Alloy.
- G. FS SS-C-153 - Cement, Bituminous, Plastic.
- H. CDA A4050 - Copper in Architecture - Handbook; current edition.
- I. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 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.
- B. Flashings and counter-flashings shall be installed at the junction of roofs with vertical surfaces and at all points as shown or as necessary to make work watertight.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products under provisions of Section 01600 - "Product Requirements".
- B. Stack preformed and pre-finished material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials during storage which may cause discoloration or staining, or damage.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 26 gauge, (0.0179 inch) thick base metal.

2.02 ACCESSORIES

- A. Fastener: Galvanized steel with soft neoprene washers at exposed fasteners

- B. Sealant to be Concealed in Completed Work: Non-curing butyl sealant.
- C. Sealant to be Exposed in Completed Work: ASTM C920; elastomeric sealant, 100 percent silicone with minimum movement capability of plus/minus 25 percent and recommended by manufacturer for substrates to be sealed; clear.
- D. Plastic Cement: FS SS-C-153, Type I-asphaltic base cement.
- E. Solder: FS QQ-S-571.
- F. Flux: FS O-F-506.

2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.

2.04 FINISH

- A. Shop prepare and prime exposed ferrous metal surfaces.
- B. Backpaint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15-mil.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.
- B. Beginning of installation means acceptance of existing conditions.

3.02 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 lines and levels, and seal top of reglets with sealant.
- D. Insert flashings into reglets to form tight fit. Secure in place with plastic wedges. Seal flashings into reglets with sealant.
- E. Secure flashings in place using concealed fasteners. Use exposed fasteners only in locations approved by Architect/Engineer.
- F. Lap and seal all joints.
- G. Apply plastic cement compound between metal flashings and felt flashings.
- H. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- I. Solder metal joints watertight for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.

3.03 INSTALLATION

- A. Conform to drawing details included in SMACNA manual:

END OF SECTION 07620

**SECTION 07 7100
ROOF SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Manufactured roof specialties, including copings and vents.

1.02 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.
- C. NRCA (RM) - The NRCA Roofing Manual; 2018.

1.03 SUBMITTALS

- A. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
- B. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
- C. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Roof Edge Flashings and Copings:
 - 1. ATAS International, Inc; Rapid-Lok Fascia: www.atas.com/#sle.
 - 2. Drexel Metals Inc; Fascia: www.drexmet.com/#sle.
 - 3. OMG Roofing Products; Formed Coping Plus: www.omgroofing.com/#sle.
 - 4. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- B. Counterflashings:

2.02 COMPONENTS

- A. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
 - 1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
 - 2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
 - 3. Wall Width: As indicated on drawings.
 - 4. Material: Formed aluminum sheet, 0.040 inch thick, minimum.
 - 5. Finish: 70 percent polyvinylidene fluoride.
 - 6. Color: As indicated on drawings.

2.03 FINISHES

- A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

END OF SECTION

**SECTION 07 7123
MANUFACTURED GUTTERS AND DOWNSPOUTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pre-finished galvanized steel gutters and downspouts.

1.02 RELATED REQUIREMENTS

Section 07 4113 - Metal Roof Panels

1.03 REFERENCE STANDARDS

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- B. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2016).
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
- D. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.
- B. Comply with applicable code for size and method of rain water discharge.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on prefabricated components.
- C. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Gutters and Downspouts:
 - 1. ATAS International, Inc: www.atas.com/#sle.
 - 2. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 MATERIALS

- A. Pre-Finished Galvanized Steel Sheet: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal.
 - 1. Finish: Shop pre-coated with modified silicone coating.
 - 2. Color: As selected by Architect from manufacturer's standard colors.

2.03 COMPONENTS

- A. Gutters: SMACNA rectangular style profile.
- B. Downspouts: SMACNA rectangular profile.
- C. Anchors and Supports: Profiled to suit gutters and downspouts.
 - 1. Anchoring Devices: In accordance with SMACNA requirements.
- D. Fasteners: Galvanized steel, with soft neoprene washers.

2.04 FABRICATION

- A. Form gutters and downspouts of profiles and size indicated.

- B. Fabricate with required connection pieces.
- C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- D. Hem exposed edges of metal.
- E. Fabricate gutter and downspout accessories; seal watertight.

2.05 FINISHES

- A. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604, multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.06 ACCESSORIES

- A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots and on-body cleanout and cover with neoprene gaskets.
 - 1. Configuration: Angular.
 - 2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that surfaces are ready to receive work.

3.02 PREPARATION

- A. Paint concealed sheet metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

- A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.
- B. Slope gutters 1/8 inch per 10 feet .
- C. Connect downspouts to downspout boots at 6 inches above grade. Grout connection watertight.
 - 1. Connect to Landscape of site drainage as indicated in drawings.

END OF SECTION

**SECTION 07 8400
FIRESTOPPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

- A. Section 09 2116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2018c.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
- C. ITS (DIR) - Directory of Listed Products; current edition.
- D. FM (AG) - FM Approval Guide; current edition.
- E. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).
- F. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
- G. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 3000 - "Submittals", for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- C. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Certificate from authority having jurisdiction indicating approval of materials used.
 - 1. Submit installation instructions and listing information from company that will supply the fire caulking seals for pipes, ducts, wires, etc. in fire resistive walls, floors, etc..

1.05 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
 - 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Verification of minimum three years documented experience installing work of this type.
 - 2. Licensed by local authorities having jurisdiction (AHJ).

1.06 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

C.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.02 FIRESTOPPING SYSTEMS

- A. Firestopping: Any material meeting requirements.
1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.
 2. Fire Ratings: See drawings for required systems and ratings.

2.03 MATERIALS

- A. Firestopping Sealants: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
- B. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant; conforming to the following:
1. Durability and Longevity: Permanent.
 2. Color: Black, dark gray, or red.
 3. Manufacturers:
 - a. A/D Fire Protection Systems Inc: www.adfire.com.
 - b. 3M Fire Protection Products: www.3m.com/firestop.
 - c. Hilti, Inc: www.us.hilti.com.
 - d. Substitutions and Product Options: Under provisions of Section 01 60 00 - "Product Requirements".
- C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

3.04 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200 JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 2500 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders.
- B. Section 07 8400 - Firestopping: Firestopping sealants.
- C. Section 08 8000 - Glazing: Glazing sealants and accessories.

1.03 REFERENCE STANDARDS

- A. ASTM C834 - Standard Specification for Latex Sealants; 2017.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- C. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- D. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2008 (Reapproved 2012).
- E. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2014.
- F. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015e1.
- G. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
- C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
 - 1. Adhesives Technology Corporation; _____: www.atcepoxy.com/#sle.
 - 2. QUIKRETE Companies; _____: www.quikrete.com/#sle.
 - 3. Sherwin-Williams Company; _____: www.sherwin-williams.com/#sle.
 - 4. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

- B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
 - 1. Adhesives Technology Corporation; _____: www.atcepoxy.com/#sle.
 - 2. QUIKRETE Companies; _____: www.quikrete.com/#sle.
 - 3. Sherwin-Williams Company; _____: www.sherwin-williams.com/#sle.
 - 4. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.
- B. Silicone Sealant: FS TT-S-01543, Class A, low modulus type; color as selected; manufactured by Dow Corning, General Electric, Sonneborn or approved equal.

2.03 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Install bond breaker backing tape where backer rod cannot be used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

- A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

**SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.
- C. Fire-rated hollow metal doors and frames.
- D. Thermally insulated hollow metal doors with frames.
- E. Hollow metal borrowed lites glazing frames.
- F. Accessories, including glazing, louvers, and matching panels.

1.02 RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware.
- B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.
- C. Section 09 9113 - Exterior Painting: Field painting.
- D. Section 09 9123 - Interior Painting: Field painting

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.
- C. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2007 (R2011).
- D. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.
- E. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.
- F. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.
- G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
- H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2018.
- I. 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; 2018a.
- J. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- K. ITS (DIR) - Directory of Listed Products; current edition.
- L. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.
- M. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.
- N. UL (DIR) - Online Certifications Directory; Current Edition.
- O. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

- B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- C. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
 - 3. Steelcraft, an Allegion brand: www.allegion.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
 - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

- A. Exterior Doors: Thermally insulated.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 - Standard-duty.
 - 1) Level 2 for door over 3 ft wide.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
 - 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 - 3. Door Thickness: 1-3/4 inches, nominal.
 - 4. Top Closures for Outswinging Doors: Flush with top of faces and edges.
 - 5. Door Face Sheets: Flush.
 - 6. Weatherstripping: Refer to Section 08 7100.
 - 7. Door Finish: Factory primed and field finished.
- B. Interior Doors, Non-Fire Rated:

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 - Standard-duty.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 3. Door Thickness: 1-3/4 inches, nominal.
 4. Texture: Smooth faces.
 5. Door Finish: Factory primed and field finished.
- C. Fire-Rated Doors:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 - Standard-duty.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
 2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
 - a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
 - b. Attach fire rating label to each fire rated unit.
 3. Door Thickness: 1-3/4 inches, nominal.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. General:
1. Comply with the requirements of grade specified for corresponding door.
 - a. ANSI A250.8 Level 1 Doors: 16 gage frames.
 2. Finish: Same as for door.
- C. Exterior Door Frames: Full profile/continuously welded type.
1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 2. Weatherstripping: Separate, see Section 08 7100.
 3. Door frame with Sidelight.
- D. Interior Door Frames, Non-Fire Rated: Knock-down type.
1. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.
 2. Frame Finish: Factory finished.
- E. Interior Door Frames, Fire-Rated: Knock-down type.
1. Fire Rating: Same as door, labeled.

2.05 PREFINISHED DOOR FRAMES

- A. Manufacture: Timely Prefinished Steel Door Frames
- B. Interior Door Frames, Non-rated:
1. Frame Material: cold rolled steel
 2. "C" Series, 18 ga. thick
 3. Frame Casings: TA-8 Steel Casing, factory finish.
 4. Color selected by architect from standard selection.
- C. Interior Door Frames, Fire Rated:
1. Frame Material: cold rolled steel
 2. "CK" Series, 18 ga. thick
 3. Frame Casings: TA-8 Steel Casing, factory finish.
 4. Color selected by architect from standard selection.

2.06 ACCESSORIES

- A. Louvers: Roll formed steel with overlapping frame; finish same as door components ; factory-installed.
 - 1. In Fire-Rated Doors: UL (DIR) or ITS (DIR) listed fusible link louver, same rating as door.

2.07 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.
- C. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Install door hardware as specified in Section 08 7100.
- E. Touch up damaged factory finishes.

3.04 TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION

**SECTION 08 1416
FLUSH WOOD DOORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flush wood doors; flush and flush glazed configuration; fire-rated and non-rated.

1.02 RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware.
- B. Section 08 8000 - Glazing.
- C. Section 09 2116 - Gypsum Board Assemblies.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).
- D. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.
- E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- F. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.
- G. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.
- H. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- I. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.
- J. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- C. Identifying Label: Each door shall bear identifying label indicating:
 - 1. Door manufacturer.
 - 2. Order number.
 - 3. Door number.
 - 4. Fire rating, if applicable.
- D.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging, and inspect for damage.

- C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.07 WARRANTY

- A. See Section - 1 7700 - Closeout Procedures
- B. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1. Haley Brothers: www.haleybros.com/#sle.
 - 2. Masonite Architectural; Aspiro Select Wood Veneer Doors: www.architectural.masonite.com/#sle.
 - 3. VT Industries, Inc; Basis of Design: www.vtindustries.com/#sle.

2.02 DOORS

- A. Doors: See drawings for locations and additional requirements.
 - 1. Quality Standard: Custom Grade, Standard Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
 - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at each location.
 - 2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
 - 3. Wood veneer facing with factory transparent finish as indicated on drawings.

2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.
- B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.04 DOOR FACINGS

- A. Veneer Facing for Transparent Finish: White birch, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.

2.05 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- C. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- D. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

- A. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
 - 1. Transparent:
 - a. System - TR-8, UV Cured Acrylated Polyester/Urethane.

- b. Stain: As selected by Architect.
- c. Sheen: Flat.

B. Factory finish doors in accordance with approved sample.

2.07 ACCESSORIES

A. Pre-finished Steel Door Frames:

- 1. Manufacturer: Timely Industries Inc., a division of SDS Industries, Inc. Web site www.timeleyframes.com; phone 800-247-6242.
- 2. Interior: "S" Series, 20 ga thick.
- 3. Interior: "CK" Series, 18 ga thick, with kerf for door seal/gasket. To be used at interior for rated openings as designated on plans.
- 4. Finish: Color to be selected by Architect from Standard and Premium range.
- 5. Substitutions: See Section 01 6000-Product Requirements.

B. Metal Louvers:

- 1. Material and Finish: Roll formed steel; pre-painted finish to color as selected.

C. Glazing: See Section 08 8000.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
 - 1. Install fire-rated doors in accordance with NFPA 80 requirements.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
 - 1. Install Pre-Finished Steel frames in accordance with manufacturer's instructions.

3.03 TOLERANCES

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION

**SECTION 08 3100
ACCESS DOORS AND PANELS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Ceiling-mounted access units.
- B. Wall and ceiling mounted access units.
- C. Non-rated access doors and frames.

1.02 RELATED REQUIREMENTS

- A. Section 09 2116 - Gypsum Board Assemblies: Openings in partitions and ceilings.
- B. Section 09 9123 - Interior Painting: Field paint finish.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

- A. Wall-Mounted Units:
 - 1. Panel Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.
 - 2. Size: As indicated.
 - 3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 - 4. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
 - 5. Basis of Design; Model "M" manufactured by Milcor. (Or approved equal)
- B. Ceiling-Mounted Units:
 - 1. Location: As indicated on drawings.
 - 2. Panel Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
 - 3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
 - 4. Size: As indicated.
 - 5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 - 6. Basis of Design; Model "DW" manufactured by Milcor. (Or approved equal)

2.02 MANUFACTURERS

- A. Milcor, Inc.
- B. J.L. Industries.
- C. Karp Associates, Inc.
- D. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.03 FABRICATION

- A. Fabricate frames, flanges and door panels of 16-gauge steel.
- B. Weld, fill and grind joints to ensure flush and square unit.
- C. Hardware: 165-degree steel hinges with removable pin, screw driver slot, quarter turn cam lock, cylinder lock with latch, two keys for each unit.

2.04 FINISH

- A. Galvanized units to be hot dipped finish. Prime coat units with alkyd primer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings for door and frame are correctly sized and located.
- B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

**SECTION 08 3323
OVERHEAD COILING DOORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electric operators and control stations.
- B. Accelerated Action overhead coiling doors, operating hardware, and electric operation.
- C. Wiring from electric circuit disconnect to operator to control station.

1.02 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- B. Section 26 0533.13 - Conduit for Electrical Systems: Conduit from electric circuit to operator and from operator to control station.
- C. Section 26 2726 - Wiring Devices: Power to disconnect.

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
- B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- C. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).
- D. UL (DIR) - Online Certifications Directory; Current Edition.
- E. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SYSTEM DESCRIPTION

- A. Electric motor operated unit with manual override in case of power failure.
- B. Within a framed opening. Surface mounted.

1.05 DESIGN REQUIREMENTS

- A. Design door assembly to satisfy non-operational Design Wind Speed without undue deflection or damage to door or assembly components.
 - 1. Design Ultimate Wind Speed of 125 MPH. In the event of high sustained wind load, use auxiliary chain hoist to open door

1.06 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general construction, electrical equipment, and component connections and details.
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- D. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.07 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Overhead Coiling Doors:
 - 1. Basis of Design; Porvene Doors, Inc.: www.porvenedoors.com.
 - 2. Raynor Garage Doors: www.raynor.com/#sle.

3. Or approved equal.
4. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 COILING DOORS

- A. Exterior Coiling Doors: Steel slat curtain.
 1. Basis of design: Model 422/ Accelerated Action System with chain override.
 - a. Use Model 422, manual with chain hoist, at Storage building.
 2. Capable of withstanding positive and negative wind loads of 40 psf, without undue deflection or damage to components.
 - a. Verify wind loads local Jurisdiction.
 3. Single thickness slats.
 4. Nominal Slat Size: 2 inches wide by required length.

2.03 MATERIALS AND COMPONENTS

- A. Curtain: conform to the following:
 1. Slats: Interlocking, minimum 22-gauge of ANSI/ASTM A653 steel, galvanized to minimum 1.25 oz/sq ft coating in accordance with ASTM A924. Cold roll formed in continuous lengths of 22 ga..
 2. Slat Ends: Each slat fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
 3. Vision Lites: Rows of vision cutouts through curtain covered with clear Lexan polycarbonate. Number of rows and height as indicated on drawings.
 4. Curtain Bottom for Slat Curtains: Fitted with angles to provide reinforcement and positive contact in closed position.
 5. Wear Straps: Polyester bands fitted vertically 1 per every 5 foot of curtain width.
 6. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
- B. Guide Construction: Two angles form a curtain guide and are bolted to a continuous wall angle. Sizes of structural steel angles are determined as required to retain curtain in guides under wind load and provide adequate mounting to jambs.
 1. Provide structural 3-Pc. guides with malleable windlocks.
- C. Hood Enclosure: 24-gauge galvanized steel; Internally reinforced to maintain rigidity and shape.
- D. Lock Hardware:
 1. Slide Bolt: Provide on single-jamb side, extending into slot in guides, with padlock on one side.
 2. Manual Chain Lift: Provide padlockable chain keeper on guide.
- E. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.04 FINISHES

- A. Curtain Slats: Galvanized steel. Pre -finished with zinc phosphate primer at manufacture.
 1. Powder coat finish (color as selected from RAL Chart). No field painting allowed.
- B. Steel Guides and Hood Enclosure: Galvanized steel. Pre-finished with zinc phosphate primer at manufacture.
 1. Powder coat finish (color as selected from RAL Chart). No field painting allowed.

2.05 FABRICATION

- A. Endlocks: Each end of alternate slats shall be fitted with endlocks to provide a wearing surface in the guides and to maintain slat alignment. Fastened with 1/4 inch rivets.
 1. Malleable Iron End-Locks: Malleable or "cast" iron end-locks shall be fitted onto every other slat.

- B. Bottom Bar: Curtain shall be reinforced with a bottom bar consisting of two 2 inch by 2 inch by 1/8 inch (50.8mm by 50.8mm by 3.21mm) structural steel angle with P.V.C. bulb astragal.
- C. Barrel: Shall be a steel pipe of diameter and wall thickness to restrict maximum deflection to 0.03 inch per foot (2.5mm/m) of door width. End bearings shall be self-lubricating ball bearings.
- D. Springs: Shall be oil tempered, grease packed helical torsion type designed with an overload factor of 25 percent. Springs mounted on a cold rolled steel inner shaft.
 - 1. High Cycle Springs: spring design is to last at least 50,000 cycles.
- E. Bracket Plates: 1/4 inch (6mm) minimum thickness steel plates to sustain and enclose ends of the door assembly.
- F. Drive end bracket plate: Fitted with a self-aligning sealed ball bearing.
- G. Guides: Shall be structural steel angles 3/16 inch (4.76mm) minimum thickness with removable head stops.
 - 1. Provide weather seal clip-on vinyl or weather stripping to seal against slat.
- H. Guide Wall Angles: 3/16 inch (4.76mm) minimum thickness structural steel angles.
- I. Hoods: Shall be 24 gauge galvanized powder coated to match slats. No field painting allowed.

2.06 ELECTRIC OPERATION

- A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by UL (DIR) or testing agency acceptable to authorities having jurisdiction.
 - 1. Provide interlock switches on motor operated units.
- B. Electric Operators:
 - 1. Mounting: Side mounted.
 - 2. Gear hoist door operator, Model Pro-GH VFD with Red/Green warning light modification as manufactured by Micanan (or approved equal); 1.5 HP, mounted in accordance with manufacturer's specifications. Provide push button stations (interior) with radio control option.
 - a. Apparatus 2- use Wall Mounted motor, configure to clear ceiling height.
 - 3. 3-Channel Universal Receiver - Model 850LM
 - 4. Provide three (3) transmitters per door. Model 894LT.
 - a. Use four-button transmitters
 - 1) Button #1 - Open/Close apparatus door-back of station
 - 2) Button #2 - Open/Close apparatus door-street facing
 - 3) Button #3 - Open/Close rolling gate
 - 4) Button #4 - Open/Close rolling gate
 - 5. Controller Enclosure: NEMA EN 10250, Type 4.
 - 6. Opening Speed: 7 seconds per 14' opening.
 - 7. Brake: Manufacturer's standard type, activated by motor controller.
 - 8. Manual override in case of power failure.
 - 9. Refer to Section 26 0583 for electrical connections.
- C. Interior Control Station: Recessed, standard three button (open-close-stop) control for each operator; 24 volt circuit. (NEMA 250, Type 4).
- D. Commercial Protector System (CPS):
 - 1. Provide "non-contact" photo safety sensors designed to sense an obstruction between jambs and signals for the door operator to reverse to open. (NEMA 250, Type 4).
- E. Safety Edge: Located at bottom of coiling door, full width, electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object, hollow neoprene covered.
 - 1. Manufacturers:
 - a. Miller Edge, Inc; -: www.milleredge.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Complete wiring from disconnect to unit components.

3.03 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch.
- C. Maximum Variation From Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet straight edge.

3.04 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

- A. Clean installed components / under provisions of Division 1.
- B. Remove labels and visible markings.

END OF SECTION

**SECTION 08 4313
ALUMINUM-FRAMED STOREFRONTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Door hardware.

1.02 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- B. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.
- C. Section 08 8000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

- A. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.
- B. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems; 2014.
- C. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.
- D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.
- E. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- F. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.
- I. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- J. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.
- K. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

- D. Samples for Initial Selection: For units with factory applied color finishes including sample of hardware and accessories involving color selection.
- E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.
- F. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a two year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

- A. Center-Set Style, Thermally-Broken:
 - 1. Basis of Design: Kawneer: Frame Style - Tri-Fab VG 451T. With GLASSvent project out windows. Door Style - Wide Stile 500 Barrier Free Entrance with 10-inch bottom. Permafluor High Performance finish.
 - 2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
- B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
 - 1. Arcadia, Inc; -: www.arcadiainc.com/#sle.
 - 2. CRL-U.S. Aluminum.
- C. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
 - 1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 BASIS OF DESIGN -- SWINGING DOORS

- A. Wide Stile, Insulating Glazing, Not Thermally-Broken:
 - 1. Basis of Design: Kawneer 500 Barrier Free.
 - 2. Thickness: 1-3/4 inches.
- B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
 - 1. Arcadia, Inc; -: www.arcadiainc.com/#sle.
- C. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
 - 1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.03 ALUMINUM-FRAMED STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.

1. Finish: High performance organic coatings.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
 2. Finish Color: As selected by Architect from manufacturer's standard line.
 3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
 7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
 8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
- B. Performance Requirements
1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 - a. Design Wind Loads: Comply with requirements of ASCE 7.
 - b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
 2. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.

2.04 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
1. Glazing Stops: Flush.
- B. Glazing: See Section 08 8000.
1. For Exterior Framing: Type IG-1.
- C. Swing Doors: Glazed aluminum.

2.05 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Fasteners: Stainless steel.
- C. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- D. Glazing Accessories: See Section 08 8000.

2.06 FINISHES

- A. High Performance Organic Coating: AAMA 2604; multiple coats, thermally cured fluoropolymer system.
- B. Color: As selected by Architect from manufacturer's standard range.

2.07 HARDWARE

- A. For each door, include weatherstripping, sill sweep strip, and threshold.

- B. Other Door Hardware: Storefront manufacturer's standard type to suit application.
 - 1. Finish on Hand-Contacted Items: Polished chrome.
 - 2. For each door, include exit device, closer, and continuous hinge.
 - 3. Lockset per specifications Section 08 7100
- C. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- H. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- J. Set thresholds in bed of sealant and secure.
- K. Install hardware using templates provided.
 - 1. See Section 08 7100 for hardware installation requirements.
- L. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.
- B. Provide field testing of installed storefront system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
 - 1. Perform a minimum of two tests in each designated area as indicated on drawings.
 - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
 - 3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
 - a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.
- C. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.04 ADJUSTING

- A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Remove excess sealant by method acceptable to sealant manufacturer.

3.06 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

**SECTION 08 5313
VINYL WINDOWS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vinyl-framed, factory-glazed windows.
- B. Operating hardware.
- C. Insect screens.

1.02 RELATED REQUIREMENTS

- A. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2017.
- B. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2012.
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- E. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2018).
- F. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.
- G. ASTM E1332 - Standard Classification for Rating Outdoor-Indoor Sound Attenuation; 2016.
- H. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2007 (Reapproved 2016).
- I. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2017.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, anchors, fasteners, glass, and internal drainage.
- C. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
 - 1. Evidence of AAMA Certification.
 - 2. Evidence of WDMA Certification.
 - 3. Evidence of CSA Certification.
 - 4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.
- D. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing of type specified and with at least three years documented experience.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Vinyl Windows:
1. Milgard Windows and Doors; www.milgard.com;
 2. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 DESCRIPTION

- A. Vinyl Windows: Factory fabricated frame and sash members of extruded, hollow, ultra-violet-resistant, polyvinyl chloride (PVC) with integral color; with factory-installed glazing, hardware, related flashings, anchorage and attachment devices.
1. Configuration: As indicated on drawings.
 2. Basis of Design: Milgard - Trinsic Series
 - a. Product Type: HS - Horizontal sliding window in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
 - b. Door Handles: Contemporary (standard)
 - c. Glazing: SunCoatMax Low-E.
 3. Color: as selected from standard range of 3 choices.
 4. Size to fit openings with minimum clearance around perimeter of assembly providing necessary space for perimeter seals.
 5. Framing Members: Fusion welded corners and joints, with internal reinforcement where required for structural rigidity; concealed fasteners.
 6. System Internal Drainage: Drain to exterior side by means of weep drainage network any water entering joints, condensation within glazing channel, or other migrating moisture within system.
 7. Glazing Stops, Trim, Flashings, and Accessory Pieces: Formed of rigid PVC, fitting tightly into frame assembly.
 8. Mounting Flange: Integral to frame assembly, providing weather stop at entire perimeter of frame.
 9. Insect Screens: Tight fitting for operating sash location.
 - a. Fiberglass: Better-vue

2.03 PERFORMANCE REQUIREMENTS

- A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
1. Performance Class (PC): LC.
 2. Performance Grade (PG): 25, with minimum design pressure (DP) of 25.06 psf.
- B. Overall Thermal Transmittance (U-value): 0.35, maximum, including glazing, measured on window sizes required for this project.
- C. Acoustic Performance: Minimum outdoor-indoor transmission class (OITC) rating of 34, when tested in accordance with ASTM E90 and ASTM E1332.

2.04 COMPONENTS

- A. Glazing: Insulated double pane, annealed glass, gray tinted, low-E coated, with glass thicknesses as recommended by manufacturer for specified wind conditions and acoustic rating indicated.
- B. Frame Depth: Manufacturer's standard.
1. Sash: 1-3/16 inch depth.
- C. Insect Screens: Aluminum, extruded or roll-formed frame with mitered and reinforced corners; apply screen mesh taut to frame; secure to window with hardware to allow easy removal.
1. Hardware: Manufacturer's standard; quantity as required per screen.
 2. Screen Mesh: Aluminum mesh.
 3. Frame Finish: Manufacturer's standard, color to match window frame and sash color.

2.05 HARDWARE

- A. Horizontal Sliding Sash: Rigid PVC interfacing tracks with screw adjustable nylon rollers in steel bracket, provide two sets for each operating sash and opening stops in head and sill track as required.
- B. Sash lock: Lever handle and keeper with cam lock, provide at least one for each operating sash.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify wall openings and adjoining water-resistive barrier seal materials are ready to receive this work.

3.02 INSTALLATION

- A. Install window unit assemblies in accordance with manufacturers instructions and applicable building codes.
- B. Install windows in accordance with ASTM E2112.
- C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities as necessary.
- D. Align window plumb and level, free of warp or twist, and maintain dimensional tolerances and alignment with adjacent work.
- E. Set sill members and sill flashing in continuous bead of sealant.

3.03 FIELD QUALITY CONTROL

- A. Provide services of vinyl window manufacturer's field representative to observe for proper installation of system and submit report.
- B. See Section 01 4000 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.
- C. Provide field testing of installed vinyl windows by independent laboratory in accordance with AAMA 502 and AAMA/WDMA/CSA 101/I.S.2/A440 during construction process and before installation of interior finishes.
 - 1. Field test for water penetration in accordance with ASTM E1105 using Procedure B - cyclic static air pressure difference; test pressure shall not be less than 1.9 psf.
 - 2. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 6.27 psf.
- D. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.04 CLEANING

- A. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.
- B. Remove protective material from pre-finished surfaces.
- C. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.
- D. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer and appropriate for application indicated.

END OF SECTION

**SECTION 08 6223
TUBULAR SKYLIGHTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tubular skylights, consisting of skylight dome, reflective tube, and diffuser assembly.
- B. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 4113 - Metal Roof Panels.
- B. Section 07 6200 - Sheet Metal Flashing and Trim: Counterflashing.
- C. Section 07 9200 - Joint Sealants: Sealants used in conjunction with skylights.

1.03 REFERENCE STANDARDS

- A. ASTM A463/A463M - Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process; 2015.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
- C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- E. ICBO/ICC AC-16 - Acceptance Criteria for Plastic Skylights; '03.

1.04 SUBMITTALS

- A. See Section 01 3000 - "Submittals", for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. ICC-ES evaluation report.
- C. Shop Drawings: Indicate configurations, dimensions, locations, fastening methods, and installation details.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Engaged in manufacture of tubular skylights for minimum of 10 years.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Skylights: Manufacturer's standard warranty for 10 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Solatube International, Inc.
2210 Oak Ridge Way - Vista, CA 92083-8341
Tel: (760) 597-440 / www.solatube.com
- B. Or approved equal.
- C. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 PRODUCTS

- A. Tubular Daylighting System: Transparent roof-mounted skylight dome and self-flashing curb, reflective tube and ceiling level diffuser assembly, transferring sunlight to interior spaces, complying with ICBO/ICC AC-16.
- B. Brighten Up Series: Solatube Model 290 DS - 14 inch Daylighting System.
 - 1. Roof Dome Assembly: DA - Dome Acrylic.
 - 2. Flashing Base:
 - a. FP - 4-inch Pitched Metal, Self Mounted -
 - b. Metal Roof Installation kit
 - 3. Diffuser Lens: L4 - White Trim with Vision Diffuser.
 - 4. Effect Lens: LN - Natural Effect Lens.
 - 5. Extension Tubes: EXX - Total Run Length to be determined by Bidding Contractor.

2.03 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. Joint Sealant: As specified in Section 07 9200 - "Joint Sealants".

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. 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 the project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's written instructions.
- B. Set roof assembly flashing in continuous bead of sealant.
- C. Seal joints exposed to weather using procedures specified in Section 07 9200 - "Joint Sealants".
- D. Conduct field test for water tightness; conduct water test in presence of Architect. Correct defective work and re-test until satisfactory.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

**SECTION 08 7000
DOOR HARDWARE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for wood and hollow metal doors.
- B. Hardware for fire-rated doors.
- C. Gate locks.

1.02 RELATED REQUIREMENTS

- A. Section 08 11 00 - Standard Steel Doors and Frames.
- B. Section 08 1416 - Flush Wood Doors.
- C. Section 32 3119 - Decorative Metal Fences and Gates

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. BHMA A156.1 - American National Standard for Butts and Hinges; 2016.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- D. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.
- E. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2016.
- G. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.
- H. UL (DIR) - Online Certifications Directory; Current Edition.
- I. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- J. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.
- K. CBC - 2022 California Building Code, based on 2021 International Building Code (IBC), with California Amendments.
- L. SDI - Steel Door Institute.
- M. DHI - Door Hardware Institute

1.04 COORDINATION

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware will be installed upon.
- B. Coordinate work of this section with other directly affected sections involving manufacturers of any internal reinforcement for door hardware.

1.05 DESIGN AND PERFORMANCE CRITERIA

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Provide door hardware products that comply with the following requirements:
- D. Applicable provisions of federal, state, and local codes.
- E. Accessibility: ADA Standards and ICC A117.1.

1. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
- F. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR) or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.

1.06 SUBMITTALS

- A. See Section 01 3000 - "Submittals", for submittal procedures.
- B. Indicate locations and mounting heights of each type of hardware.
- C. Submit Schedule of Hardware.
- D. Provide product data on specified hardware.

1.07 OPERATION AND MAINTENANCE DATA

1. Submit operation and maintenance data.
- B. Include data on operating hardware, lubrication requirements, and inspection procedures related to preventive maintenance.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and protect products under provisions of Section 01 60 00 - "Product Requirements"
 1. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.
- B. Deliver keys to Owner by security shipment direct from hardware supplier.
- C. Protect hardware from theft by cataloging and storing in secure area.

1.09 MAINTENANCE PRODUCTS

- 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.

1.10 WARRANTY

- A. Provide five-year warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Allegion Brands, Ives, LCN, Schlage, Steelcraft, Von Duprin, or Glynn Johnson; -: www.allegion.com/us.
- B. Trimco Hardware; -: www.trimcohardware.com.
- C. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 GENERAL REQUIREMENTS

- A. Provide door hardware specified, or as required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.
- B. Provide items of a single type of the same model by the same manufacturer.
- C. Provide products that comply with the following:
 1. Applicable provisions of federal, state, and local codes.
 2. Accessibility: ADA Standards and ICC A117.1.
 3. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
 4. Applicable provisions of NFPA 101, Life Safety Code.
 5. Fire-Rated Doors: NFPA 80.

6. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

2.03 HINGES

- A. Refer to Hardware Sets.
- B. Hinges: Provide hinges on every swinging door.
- C. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
 1. Provide ball-bearing hinges at all doors having closers.
- D. Provide hinges in the quantities indicated.
- E. Provide non-removable pins on exterior out swinging doors.
- F. Where electrified hardware is mounted in door leaf, provide power transfer hinges.

2.04 LOCKS AND LATCHES

- A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
- B. Hardware Sets indicate locking functions required for each door.
- C. If no hardware set is indicated for a swinging door provide an office lockset.
- D. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
- E. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.
- F. Lock Cylinders: Manufacturer's standard tumbler type, six-pin standard core.
- G. Provide cams and/or tailpieces as required for locking devices required.
- H. Latches: Provide a latch for every door that is not required to lock, unless specifically indicated "push/pull" or "not required to latch".

2.05 KEYING

- A. Door Locks: Construction keying only. The Owner to provide key system compatible with the 6 pin system after acceptance of the building.
 1. Supply two (2) keys for each lock. 2.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available to power operated devices and of the correct characteristics.
- C. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions, requirements of SDI and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.
- D. Conform to ANSI A117.1 for positioning requirements for the handicapped.

3.03 PROTECTION

- A. Protect finished Work under provisions of Section 01 7000 - Execution Requirements.
- B. Do not permit adjacent work to damage hardware or finish.

3.04 SCHEDULE

- a. Numbers have been taken from the following:
- b. IVE -H.B.Ives, LCN -LCN Closers, SCE -Schlage Electronics, SCH-Schlage Lock Co., VON - Von Duprin,ZER -Zero Int, TRI-Trilogy

FIRE STATION DOOR HARDWARE SETS:

HW SET: 01

DOOR(S): LOBBY ENTRANCE

1					
1	EA	CONT. HINGE	112 XY	628	IVE
1	EA	CLASSROOM LOCK	L9070T 06A	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP-EDA	689	LCN
1	EA	PA MT PLATE	4040XP-18PA	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	SET	SEALS	BY DOOR/FRAME MFR		B/O
1	EA	THRESHOLD	103A-223 OR AS DETAILED	A	ZER

REMINDER: HARDWARE BY DOOR MANUFACTURER.

HW SET: 02

DOOR(S): LOBBY / HALLWAY 2

14					
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B- CS	630	IVE
1	EA	FLOOR STOP	FS439	630	IVE

HW SET: 03

DOOR(S): OFFICES 1 – 3

15	43	45			
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	KEYLESS ACCESS LOCK	DL2700WPIC	626	TRI
1	EA	FLOOR STOP	FS 439	630	IVE

HW SET: 04**DOOR(S): PANTRY**

17					
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	PASSAGE	ND10S RHO	626	SCH
1	EA	FLOOR STOP	FS439	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 05**DOOR(S): DINING, HALLWAY 3, APP. BAY & BC'S QUARTERS**

2	4	5	9		
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP DL2700WPIS-Y	630	IVE
1	EA	KEYLESS LOCK		626	TRI
1	EA	SURFACE CLOSER	4040XP EDA ST-1944	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B- CS	630	IVE
1	EA	FLOOR STOP	FS18S/FS18L	BLK	IVE
1	EA	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	102A OR AS DETAILED	A	ZER

HW SET: 06**PAIR DOOR(S): EXERCISE, STORAGE BUILDING**

3	56				
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA ST-1944	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18S/FS18L	BLK	IVE
1	EA	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	ASTRAGAL	47A (PAINT TO MATCH DOOR)	A	ZER
1	EA	THRESHOLD	102A OR AS DETAILED	A	ZER

HW SET: 07**DOOR(S): EXERCISE, DAY RM, HALLWAYS, KITCHEN**

16	18	19	20	21	22 & 39
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE

1	EA	FLOOR STOP	FS439	630	IVE
3	EA	SILENCER	SR64/SR65	GRY	IVE

HW SET: 8**DOOR(S): COMM. RM. / MEDIC STORAGE**

42	44				
3	EA	HINGE	5BB1 5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV REQUIRES WALL BACKING	630	IVE

HW SET: 9**DOOR(S): ICE*, JANITOR, FSR, UTILITY**

49*	50	51	55		
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
1	EA	PASSAGE SET	ND80TD RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

OH STOP AND HOLDER 410F-630- AT DOOR 49.

HW SET: 10**DOOR(S): ADA RESTROOM, BATHS, APP. BAY RESTROOM**

25	34	35	36	37	38
46*	54				
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	ND40S RHO	626	SCH
1	EA	SURFACE CLOSER*	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS439	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	KICK DOWN	FS452-4	626	IVE

ACCESSIBLE RESTROOM-NO KICK DOWN FOR DOOR 46

HW SET: 11**DOOR(S): SLEEP QUARTERS**

23	24	26	27	28	29
30	31	32	33		

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	ND40S RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS439	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

HW SET: 12**DOOR(S): MECH.**

41					
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP	626	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
1	EA	MOUNTING BRACKET	MB	689	IVE
1	EA	SURFACE CLOSER	4040XP PA ST-1755	689	LCN
1	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV REQUIRES WALL BACKING	630	IVE
1	EA	SILENCER	SR64/SR65	GRY	IVE

HW SET: 13**DOOR(S): LAUNDRY**

40					
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS439	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

HW SET: 14**DOOR(S): TURN-OUT GEAR**

52	53				
3	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS439	630	IVE

3	EA	SILENCER	SR64/SR65	GRY	IVE
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HW SET: 15**DOOR(S): HALLWAY / APPARATUS**

47	48				
3	EA	HINGE	5BB1HW 5 X 4.5 NRP	630	IVE
1	EA	EXIT DEVICE	99L-996L-R/V 06-6	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH ST-1595	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	102A OR AS DETAILED	A	ZER

HW SET: 16**DOOR(S): ELECTRICAL / STORAGE BUILDING**

10	58*				
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	AX-99-L-NL-06	626	VON
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18S/FS18L	BLK	IVE
1	EA	GASKETING	328AA-S	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	102A OR AS DETAILED	A	ZER

OMIT PANIC HARDWARE FOR DOOR 58

HW SET: 17A**PERSONNEL GATE: TRASH ENCLOSURE**

61					
1	EA	CLASSROOM LOCK	ND50 RHO	626	SCH

BALANCE OF HARDWARE BY GATE FABRICATOR**HW SET: 17B****PERSONNEL GATE(S):**

59	60				
1	EA	KEYLESS ACCESS	DL2700WPIC-26D	TRI	

BALANCE OF HARDWARE BY GATE FABRICATOR

ADMINISTRATION BUILDING DOOR HARDWARE SET: ADDITIVE ALTERNATE #1**HW SET: 18****DOOR(S): LOBBY ENTRANCE**

65					
1	EA	CONT. HINGE	112 XY	628	IVE
1	EA	CLASSROOM LOCK	L9070T 06A	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP-EDA	689	LCN
1	EA	PA MT PLATE	4040XP-18PA	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	SET	SEALS	BY DOOR/FRAME MFR		B/O
1	EA	THRESHOLD	103A-223 OR AS DETAILED	A	ZER

REMINDER: HARDWARE BY DOOR MANUFACTURER.

HW SET: 19**DOOR(S): LOBBY / RECEPTION**

72	73	88			
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B- CS	630	IVE
1	EA	FLOOR STOP	FS439	630	IVE

HW SET: 20**DOOR(S): OFFICES 1 – 7**

78	79	80	81	82	83
84	85				
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1	EA	FLOOR STOP	FS 439	630	IVE

HW SET: 21**DOOR(S): BREAK / PANTRY**

74	90				
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE

1	EA	PASSAGE	ND10S RHO	626	SCH
1	EA	FLOOR STOP	FS439	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 22**DOOR(S): OPEN OFFICE, TRAINING, HALLWAY 1**

67	68	69			
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	KEYLESS LOCK	DL2700WPIS-Y	626	TRI
1	EA	SURFACE CLOSER	4040XP EDA ST-1944	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18S/FS18L	BLK	IVE
1	EA	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	102A OR AS DETAILED	A	ZER

HW SET: 23**DOOR(S): JANITOR, COMM. RM., STORAGE**

75	87	89			
3	EA	HINGE	5BB1 5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV REQUIRES WALL BACKING	630	IVE

HW SET: 24**DOOR(S): RESTROOMS**

71	76	77			
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	ND40S RHO	626	SCH
1	EA	SURFACE CLOSER*	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS439	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

HW SET: 25**PAIR DOOR(S): MECH. RM.**

86					
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP	626	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
1	EA	MOUNTING BRACKET	MB	689	IVE
1	EA	SURFACE CLOSER	4040XP PA ST-1755	689	LCN
1	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV REQUIRES WALL BACKING	630	IVE
1	EA	SILENCER	SR64/SR65	GRY	IVE

HW SET: 26**DOOR(S): ELECTRICAL / FSR**

66*		70			
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	AX-99-L-NL-06	626	VON
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B- CS	630	IVE
1	EA	FLOOR STOP	FS18S/FS18L	BLK	IVE
1	EA	GASKETING	328AA-S	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	102A OR AS DETAILED	A	ZER

OMIT PANIC HARDWARE FOR DOOR 66

HW SET: 27**PAIR DOOR(S): STORAGE BUILDING**

91					
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA ST-1944	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18S/FS18L	BLK	IVE
1	EA	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	ASTRAGAL	47A (PAINT TO MATCH DOOR)	A	ZER
1	EA	THRESHOLD	102A OR AS DETAILED	A	ZER

STK Architecture, Inc.

HW SET: 28

PERSONNEL GATE(S):

92	93				
1	EA	KEYLESS ACCESS	DL2700WPIC-26D	TRI	

BALANCE OF HARDWARE BY GATE FABRICATOR

END OF SECTION

**SECTION 08 8000
GLAZING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units, doors, interior storefront, shower doors.
- C. Glazing compounds.

1.02 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealants for other than glazing purposes.
- B. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors.
- C. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.
- D. Section 08 4313 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.
- E. Section 08 5313 - Vinyl Windows: Glazing provided by window manufacturer.
- F. Section 08 8300 - Mirrors.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2015).
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- F. ASTM C1036 - Standard Specification for Flat Glass; 2016.
- G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
- H. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- I. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.
- J. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.
- K. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.
- L. GANA (GM) - GANA Glazing Manual; 2008.
- M. GANA (SM) - GANA Sealant Manual; 2008.
- N. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2017.
- O. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014, with Errata (2017).
- P. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2017.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.

- B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods. Maintain one copy on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Float Glass Manufacturers:
 - 1. Guardian Glass, LLC: www.guardianglass.com/#sle.
 - 2. Pilkington North America Inc: www.pilkington.com/na/#sle.
 - 3. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
 - 4. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Design Pressure: Calculated in accordance with ASCE 7.
 - 2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - 3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - 4. Glass thicknesses listed are minimum.
- B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
 - 1. In conjunction with weather barrier related materials described in other sections, as follows:
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
 - 1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 - 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 - 2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
 - 3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
 - 4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

2.04 INSULATING GLASS UNITS

- A. Manufacturers:
 - 1. Glass: Any of the manufacturers specified for float glass.
 - 2. Guardian Glass, LLC; -: www.guardianglass.com/#sle.
 - 3. Vitro Architectural Glass (formerly PPG Glass); -: www.vitroglazings.com/#sle.
 - a. Basis of Design
 - 4. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- B. Insulating Glass Units: Types as indicated.
 - 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 - 2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 - 3. Spacer Color: Black.
 - 4. Edge Seal:
 - 5. Color: Black.
 - 6. Purge interpane space with dry air, hermetically sealed.
- C. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
 - 1. Applications: Exterior glazing unless otherwise indicated.
 - 2. Space between lites filled with air.
 - 3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
 - a. Tint: Optigray.
 - b. Coating: Solarban 60, on #2 surface.
 - 4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
 - a. Use fully tempered where indicated on drawings.
 - b. Tint: Clear.
 - 5. Total Thickness: 1 inch.
 - 6. Thermal Transmittance (U-Value), Winter - Center of Glass: 29, nominal.
 - 7. Solar Heat Gain Coefficient (SHGC): .30, nominal.

2.05 GLAZING UNITS

- A. Type G-1 - Monolithic Exterior Vision Glazing:
 - 1. Applications: Exterior glazing unless otherwise indicated.
 - 2. Glass Type: Annealed float glass.
 - 3. Tint: Clear.
 - 4. Thickness: 1/4 inch, nominal.
 - 5. Manufacturers:
 - a. Tecnoglass; Low-E Glass: www.tecnoglass.com/#sle.
 - 1) Glass: Laminated glass, 2-Ply.
 - (a) Compliance: Laminate float glass in accordance with ASTM C1172.
- B. Type G-2 - Monolithic Interior Vision Glazing:
 - 1. Applications: Interior glazing unless otherwise indicated.
 - 2. Glass Type: Fully tempered float glass.
 - 3. Tint: Clear.
 - 4. Thickness: 1/4 inch, nominal.

- C. Type G-3 - Monolithic Safety Glazing: Non-fire-rated.
 - 1. Applications:
 - a. Glazed lites in doors, except fire doors.
 - b. Glazed sidelights to doors, except in fire-rated walls and partitions.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations indicated on drawings.
 - 2. Glass Type: Fully tempered safety glass as specified.
 - 3. Tint: Clear.
 - 4. Thickness: 1/4 inch, nominal.

2.06 GLAZING COMPOUNDS

- A. Type GC-5 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; black color.

2.07 ACCESSORIES

- A. Setting Blocks: Neoprene, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
- D. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 INSTALLATION, GENERAL

- A. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

3.03 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.04 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

**SECTION 08 8300
MIRRORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass mirrors.
 - 1. Tempered safety glass.

1.02 REFERENCE STANDARDS

- A. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
- B. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.
- C. GANA (GM) - GANA Glazing Manual; 2008.
- D. GANA (SM) - GANA Sealant Manual; 2008.
- E. GANA (TIPS) - Mirrors: Handle with Extreme Care (Tips for the Professional on the Care and Handling of Mirrors); 2011.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods.

1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Mirrors:
 - 1. Glasswerks: www.glasswerks.com;
 - 2. Trulite Glass and Aluminum Solutions; -: www.trulite.com/#sle.
 - 3. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 MATERIALS

- A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.
- B. Mirror Glass: Clear, tempered safety glass; ASTM C1048, with copper and silver coatings, and protective overcoating.
 - 1. Thickness: 1/4 inch.
 - 2. Edges: Flat Polished.
 - 3. Size: As indicated on drawings.

2.03 ACCESSORIES

- A. Mirror Attachment Accessories: J-bar, Clips and adhesive.
 - 1. CLR J-bar Deep nose Aluminum J channel; Bright Anodized finish.
- B. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.
 - 1. Application Temperature: Minus 35 to 140 degrees F at contact surfaces.

2. Volatile Organic Content (VOC): Less than 7 percent by weight.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.

3.03 INSTALLATION

- A. Install mirrors in accordance with manufacturer's recommendations.
- B. Set mirrors plumb and level, and free of optical distortion.
- C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.
- D. Frameless Mirrors: Set mirrors with clips, and anchor rigidly to wall construction.
 1. Set mirror using J bar and adhesive applied in accordance with adhesive manufacture's instructions.

3.04 CLEANING

- A. Remove wet glazing materials from finish surfaces.
- B. Remove labels after work is complete.
- C. -Clean mirrors and adjacent surfaces.

END OF SECTION

**SECTION 08 9100
LOUVERS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Louvers, frames, and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 4646 - Fiber Cement Siding
- B. Section 07 6200 - SHEET METAL FLASHING AND TRIM.
- C. Section 09 2400 - Cement Plastering (Stucco).
- D. Section 09 9113 - Exterior Painting: Field painting.

1.03 REFERENCE STANDARDS

- A. AMCA 511 - Certified Ratings Program for Air Control Devices; 2010.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.
- C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.

1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Ruskin, 3900 Dr Greaves Rd., Kansas City, MO 64030, Ph: 816-761-7476. Web site: www.ruskin.com.
- B. Substitutions: See Section 01 6000-PRODUCT REQUIREMENTS.

2.02 LOUVERS

- A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
- B. Drainable Stationary Louver: Architectural Louvers.
 - 1. Model E4DS Stationary Roll Formed Steel. Size as indicated on plans.
 - 2. Net free area 50% min.
 - 3. Extended sill where required.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

3.02 INSTALLATION

- A. Install louver assembly in accordance with manufacturer's instructions.
- B. Install louvers level and plumb.

- C. Align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
- D. Secure louver frames in openings with concealed fasteners.

3.03 SCHEDULES

- A. Fire Station - Entry Tower East Wall: Intake louver, hinged bird screen, prefinished to match adjacent window frames - field verify.
 - 1. See Window Type "I" on sheets A2.2A and A2.3A.
- B. Admin. Building - Entry Tower East Wall: Intake louver, hinged bird screen, prefinished to match adjacent window frames - field verify.
 - 1. See Window Type "R" on sheets A2.2B and A2.3B.

END OF SECTION

**SECTION 09 2116
GYPSUM BOARD ASSEMBLIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Acoustic insulation.
- C. Gypsum wallboard.
- D. Joint treatment and accessories.
- E. Textured finish system.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Building framing and sheathing.
- B. Section 07 2100 - Thermal Insulation: Acoustic insulation.
- C. Section 07 2500 - Weather Barriers: Water-resistive barrier
- D. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.
- E. Section 07 9200 - Joint Sealers: Acoustic sealant.

1.03 REFERENCE STANDARDS

- A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017.
- B. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2014).
- C. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
- D. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2018b.
- E. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- F. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.
- G. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.
- H. GA-226 - Application of Gypsum Board to Form Curved Surfaces; Gypsum Association; 2016.
- I. GA-600 - Fire Resistance Design Manual; 2015.
- J. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 3 years of experience.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:

1. Acoustic Attenuation: STC as indicated calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:
 1. Air Pressure Within Shaft: Sustained loads of 5 lbf/sq ft with maximum mid-span deflection of L/240.
 2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- D. Shaft Walls at Elevator Shafts: Provide completed assemblies with the following characteristics:
 1. Air Pressure Within Shaft: Intermittent loads of 5 lbf/sq ft with maximum mid-span deflection of L/240.
 2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- E. Fire-Resistance-Rated Assemblies: Provide completed assemblies with the following characteristics:
 1. Fire-Resistance-Rated Partitions: As indicated in plans..
 2. Fire-Resistance-Rated Floor-Ceiling: One (1) hour fire rating.
 - a. Provide per ICC-ES report as indicated in drawing.
 3. ICC IBC Item Numbers: Comply with applicable requirements of ICC IBC for the particular assembly.

2.02 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 1. CertainTeed Corporation; <>: www.certainteed.com.
 2. Georgia-Pacific Gypsum; <>: www.gpgypsum.com.
 3. Gold Bond Building Products; www.goldbondbuilding.com
 4. PABCO Gypsum; <>: www.pabcogypsum.com.
 5. USG Corporation; <>: www.usg.com.
 6. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold resistant board is required at restroom walls, restroom ceilings, washing machine and mop sink areas..
 3. At all locations use Type X board, UL or WH listed.
 4. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.
- C. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 1. Application: Ceilings, unless otherwise indicated.
 2. Thickness: 5/8 inch.
 - a. 1/2" where indicated in fire rated assemblies
 3. Edges: Tapered.
 4. Products:
 - a. USG Corporation; Sheetrock Brand Sag-Resistant Interior Gypsum Ceiling Board.
 - b. Gold Bond- Fire Shield 1/2" thick, where indicated as proprietary product.
 - c. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.03 GYPSUM WALLBOARD ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3-1/2 inch.
- B. Finishing Accessories: ASTM C1047, galvanized steel, rolled zinc, or rigid plastic, unless noted otherwise.
 - 1. Types: As detailed or required for finished appearance.
 - 2. L-Trim: Sized to fit 5/8 inch thick gypsum wallboard. Flexible PVC for radiused opening.
 - 3. Products:
 - a. Same manufacturer as framing materials.
 - b. Cemco; www.cemcosteel.com; Ph-800-775-2362.
 - c. Trim-tex, Inc: www.trim-tex.com.
 - d. Fry Reglet Corp.. www.fryreglet.com.
 - e. Stockton Products: www.stocktonproducts.com.
 - f. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 - 1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
 - 2. Joint Compound: Setting type, field-mixed.
- D. Textured Finish Materials: Latex-based compound; plain.
- E. Nails for Attachment to Wood Members: ASTM C514.
- F. Adhesive for Attachment to Concrete:
 - 1. Products:
 - a. Franklin International, Inc; Titebond PROvantage Professional Drywall Adhesive: www.titebond.com/#sle.
 - b. Liquid Nails, a brand of PPG Architectural Coatings; LN-2000 FUZE*IT All Surface Construction Adhesive: www.liquidnails.com/#sle.
 - c. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

- A. Suspended Ceilings and Soffits: Space framing and furring members as permitted by standard.
- B. Studs: Space studs at 16 inches on center.
 - 1. Extend partition framing to structure where indicated and to ceiling in other locations.
- C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- D. Blocking: Install wood blocking for support of:
 - 1. Framed openings.
 - 2. Wall-mounted cabinets.
 - 3. Plumbing fixtures.
 - 4. Toilet partitions.
 - 5. Toilet accessories.
 - 6. Wall-mounted door hardware.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions. See wall types in drawings

3.04 BOARD INSTALLATION

- A. Comply with ASTM C840 and GA-216. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- C. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- D. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 - 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

- A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
 - 2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 3. Level 3: Walls to receive textured wall finish.
 - a. Prime drywall PRIOR to texturing.
 - 4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - 5. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
 - 2. Taping, filling, and sanding are not required at surfaces behind fixed cabinetry.
- C. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.07 TEXTURE FINISH

- A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.
- B. Prime drywall PRIOR to texturing.

3.08 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

**SECTION 09 2400
CEMENT PLASTERING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cement plastering.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Wood stud framing for plaster.
- B. Section 07 2500 - Weather Barriers: Water-resistive barrier.
- C. Section 09 9113 - Exterior Painting.

1.03 REFERENCE STANDARDS

- A. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).
- B. ASTM A924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process; 2018.
- C. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster; 2018a.
- D. ASTM C932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering; 2006 (Reapproved 2013).
- E. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2019.
- F. ASTM C933 - Standard Specification for Welded Wire Lath; 2018.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide data on plaster materials and trim accessories.
- C. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

- A. Exterior Plaster Work: Do not apply plaster when substrate or ambient air temperature is 40 degrees F or lower, or when temperature is expected to drop below 40 degrees F within 48 hours of application.

PART 2 PRODUCTS

2.01 CEMENT PLASTER APPLICATIONS

- A. Lath Plaster Base: Metal lath.
 - 1. Plaster Type: Factory prepared plaster mix.
 - 2. Number of Coats: Three.
 - 3. First Coat: Apply to a nominal thickness of 3/8 inch.
 - 4. Second Coat: Apply to a nominal thickness of 3/8 inch.
 - 5. Leveling Coat: Apply to a nominal thickness of 1/32 to 1/16 inch.
 - 6. Finish: Acrylic.
- B. Solid Plaster Base: Concrete masonry.
 - 1. Number of Coats: Two.
 - 2. First Coat: Apply to a nominal thickness of 1/4 inch.
 - 3. Leveling Coat: Apply to a nominal thickness of 1/32 to 1/16 inch.
 - 4. Finish: Acrylic.

2.02 FACTORY PREPARED CEMENT PLASTER

- A. Exterior Portland cement plaster system made of scratch and brown base coat, leveling coat with reinforcing mesh, and acrylic finish coat; install in accordance with ASTM C926.
 - 1. Manufacturer - Basis of Design:
 - a. LaHabra; FastWall 300 with Krak-Shield: www.lahabrastucco.com/#sle.
 - b. Parex USA: DRP Coating: www.parexusa.com
 - 2. Other Acceptable Manufacturers:
 - a. Dryvit Systems, Inc: www.dryvit.com/systems/stucco/#sle.
 - b. Sika Corporation: www.parex.com/#sle.
 - c. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- B. Premixed Base Coats: Mixture of cement, aggregate, fibers, and proprietary admixtures for scratch and brown coats; install in accordance with ASTM C926.
- C. Premixed Leveling Coat: Acrylic polymer-based blend approved for use with plaster manufacturer's base coat and finish materials.
 - 1. Include embedded 4.5oz. reinforcement mesh.
- D. Premixed Textured Coating: Polymer modified acrylic coating, integrally colored, and trowel applied to substrates prepared in accordance with manufacturer's written installation instructions.
 - 1. Color: As indicated on drawings.

2.03 ACCESSORIES

- A. Lath:
 - 1. Wire Size: 17 gauge, 0.453 inch.
 - 2. Galvanized: ASTM A641/A641M.
 - 3. Opening Size: 11/16 by 1-1/2 inches.
 - 4. Comply with ASTM C933.
- B. Diamond Mesh Metal Lath: ASTM C847, galvanized; self-furring. Weight: as specified in ASTM C841 or ASTM C1063 for framing spacing.
- C. Finishing Accessories: ASTM C1063; extruded aluminum alloy (6063 T5), galvanized steel sheet ASTM A924/A924M G90, or rolled zinc, unless noted otherwise.
 - 1. Types: As detailed or required for finished appearance.
 - 2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed plaster edges.
- D. Galvanized Lathing Accessories: All galvanized metal moldings shall be 26 gauge thick, installed in full ten-foot minimum lengths wherever possible. Molding shall standard products specified, meeting ASTM D2201 (to be set for 7/8" grounds).
 - 1. Acceptable Manufacturers:
 - a. CEMCO (California Expanded Metal Company), City of Industry, CA (800 / 775-2362).
 - 2. Exterior Galvanized Plaster Corneraid: Stockton #Wire-CA.
 - 3. Exterior Galvanized / Plaster Plastic Nose Corner Bead: Stockton #Wire-PNCB.
 - 4. Conventional Arch-Aid: Stockton #Wire-AA.
 - 5. Plastic Nose Arch Bead: Stockton #Wire-DCB.
 - 6. Exterior "Long Flange" Galvanized / Plaster Plastic Nose Corner Bead: Stockton #Wire-PNLF.
- E. Control Joint; Cemco Double V #15, www.cemco.com.
- F. Drip Screed; Stockton Metals; www.stocktonproducts.com, Extruded products
 - 1. PCS: Plaster Channel Screed, Aluminum, 1/2" reveal.
- G. Bonding Compound: Provide type recommended for bonding plaster to solid surfaces, complying with ASTM C932.

- H. Reinforcing Mesh: 4.5 oz/sq yd alkali-resistant mesh.
- I. Water-Resistive Barrier: See Section 07 2500.

2.04 TRIM-FOAM SHAPES

- A. Coated Expanded Polystyrene Shapes:
 - 1. Shall be coated with polymer-modified, cement-based base coat.
 - 2. Minimum nominal density shall be available in 1#, 2# and 3# density.
 - 3. Size as noted on drawings.
- B. Reinforcing Mesh: An alkali-resistant glass fiber mesh treated for compatibility with other system materials, made from continuous multi-end strands with tensile strength of not less than 145 lb/inch and 150 lb/inch wrap and fill directions per ASTM D5035, comply with ASTM D578.
 - 1. PAREX Standard Non-Woven Mesh 353: Non-woven and shift-proof.
 - 2. PAREX Long Detail Mesh 355: Standard impact resistance reinforcing fabric, 4.5 oz/sq yd.
 - a. Manufacturer: PAREX (USA) or approved equal. 4125 E. La Palma Avenue, Suite 250, Anaheim, California 92807, (714) 778-2266 / www.parex.com
- C.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are properly in place.

3.02 PREPARATION

- A. Roughen smooth concrete surfaces and apply bonding compound in accordance with manufacturer's written installation instructions.

3.03 INSTALLATION - WATER-RESISTIVE BARRIER

- A. Where cement plaster is installed as part of a barrier wall system, install two layers of water-resistive barrier in accordance with water-resistive barrier manufacturer's instructions.
- B. Integrate water-resistive barrier with flashing accessories, and adjacent doors, windows, penetrations, and cladding transitions.
- C. Apply water-resistive barrier horizontally with upper layer lapped over lower layer at least 2 inches.
- D. For two layer applications, start with two horizontal layers at bottom of exterior wall or structure.

3.04 MIXING

- A. Mix only as much plaster as can be used prior to initial set.
- B. Mix materials dry, to uniform color and consistency, before adding water.
- C. Protect mixtures from frost or freezing temperatures, contamination, and excessive evaporation.
- D. Admix - Acrylic Bonder & Admix.

3.05 APPLICATION

- A. Apply plaster in accordance with manufacturer's written instructions and comply with ASTM C926.
- B. Base Coats:
 - 1. Apply base coat(s) to fully embed lath and to specified thickness.
 - 2. Follow guidelines in ASTM C926 and manufacturer's written installation instructions for moist curing base coats and application of subsequent coats.
- C. Leveling and Reinforcing Coat (Fastwall 100 Krak-Shield Stucco Assembly):

1. After Moist Curing, allow Stucco Base to air dry a minimum of 24 hours before applying the leveling and reinforcing coat.
 2. Using a stainless steel trowel, apply the Stucco Level Coat over the Stucco Base at a thickness of $\frac{1}{16} - \frac{3}{32}$ in. (1.6 – 2.4 mm).
 3. Fully embed the Standard Mesh into the wet Stucco Level Coat including diagonal strips at corners of openings and trowel smooth. If Standard Mesh is used, seams are overlapped $2\frac{1}{2}$ in (63 mm).
- D. Finish Coats:
1. Primer and Acrylic Coatings:
 - a. Remove surface contaminants such as dust and dirt without damaging substrate.
 - b. Apply primer in accordance with manufacturer's instructions.
 - c. Apply finish coating in number of coats and to thickness recommended by manufacturer.
 - d. Before the application of the finish, the base coat must have cured a minimum of 24 hours or longer as required by weather conditions. Examine the cured base coat for any irregularities.
 - e. Texture; Sand smooth finish.

3.06 TOLERANCES

- A. Maximum Variation from True Flatness: $\frac{1}{4}$ inch in 10 feet.

3.07 REPAIR

- A. Patching: Remove loose, damaged or defective plaster and replace with plaster of same composition; finish to match surrounding area.

END OF SECTION

**SECTION 09 3000
TILING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Cementitious backer board as tile substrate.
- D. Setting materials.
- E. Grout materials.
- F. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Substrate for mortar bed.
- B. Section 07 9200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- C. Section 09 2400 - Cement Plastering: Lath and Portland cement scratch coat, where required by the TCNA (HB) Method specified.

1.03 REFERENCE STANDARDS

- A. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).; 2017.
- B. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship; 2019.
- C. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2017.
- D. ANSI A118.1 - American National Standard Specifications for Dry-Set Cement Mortar; 2012 (Revised).
- E. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2013 (Revised).
- F. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2010 (Reaffirmed 2016).
- G. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation; 2014.
- H. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014.
- I. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2012.
- J. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018.
- K. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2017.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

1. Mortar and grout manufacturer's technical data sheets indicating suitability for the installation specified and compliance standards.
- C. Samples: Submit the following for each type, color, size and finish included in the work.
 1. Full size tile and trim shapes.
 2. Grout color samples.
 3. Sealant color samples and Prefabricated Joint/Transition Strip samples.
- D. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 01 6000 - PRODUCT REQUIREMENTS, for additional provisions.
 2. Extra Tile:
 - a. Provide (3) three extra boxes each of porcelain wall and floor tile.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
- B. Installer Qualifications: Natural Stone Institute (NSI) Accredited Commercial B Contractor (light commercial): www.naturalstoneinstitute.org/#sle.
- C. Installer Qualifications:
 1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.
- B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.
- C. Illuminate the work area during installation providing the same level and angle of illumination as will be available for final inspection.

PART 2 PRODUCTS

2.01 TILE

- A. Manufacturers:
 1. Dal-Tile Corporation: www.daltile.com/#sle.
 2. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- B. Ceramic Mosaic Tile: ANSI A137.1 standard grade.
 1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 2. Size: 2 by 2 inch, nominal at Restrooms for Admin. Building.
 3. Shape: Square.
 4. Edges: Square.
 5. Surface Finish: Unglazed.
 6. Color(s): As indicated on drawings.
 - a. See Finish Plan, sheet A2.7.
 7. Products:
 - a. Dal-Tile Corporation; _____: www.daltile.com/#sle.
 - b. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- C. Glazed Wall Tile: ANSI A137.1, standard grade.
 1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
 2. Sizes:

- a. 4 by 12 inch, nominal at Fire Station Kitchen.
 - b. 4 by 24 inch, nominal at Baths & Restrooms.
 3. Edges: Square.
 4. Surface Finish: High gloss.
 5. Color(s): As indicated on drawings.
 - a. See Finish Plan, sheet A2.7.
 6. Products:
 - a. Basis of Design: DalTile Corporation: www.daltile.com/ Linear, Color Wheel Collection.
 - b. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- D. Glazed Accent Wall Tile, Type Exterior: ANSI A137.1, standard grade.
 1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
 2. Size: 3 by 12 inch, nominal.
 3. Edges: Square.
 4. Surface Finish: Matte glaze.
 5. Color(s): As indicated on drawings.
 - a. See Finish Plan, sheet A2.7.
 6. Products:
 - a. Basis of Design: DalTile Corporation: www.daltile.com/#sle. Natural Hues Eco-Body ceramic .
 - b. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: Satin brass anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
 1. Applications:
 - a. Open edges of wall tile.
 - b. Open edges of floor tile.
 - c. Floor to wall joints.
 2. Manufacturers:
 - a. Schluter-Systems: www.schluter.com. Basis of Design
 - 1) Styles as indicated in drawings.
 - b. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.03 SETTING MATERIALS

- A. Provide setting and grout materials from same manufacturer.
- B. Manufacturers:
 1. LATICRETE International, Inc; -: www.laticrete.com/#sle.
 2. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- C. Epoxy Adhesive and Mortar Bond Coat: ANSI A118.3.
 1. Applications: Where indicated on drawings.
 2. Products:
 - a. Custom Building Products; EBM-Lite Epoxy Bonding Mortar: www.custombuildingproducts.com/#sle.
- D. Dry-Set Portland Cement Mortar Bond Coat: ANSI A118.1.
- E. Mortar Bed Materials: Pre-packaged mix of Portland cement, sand, latex additive, and water.

2.04 GROUTS

- A. Grout: Tile Council of America (TCA) formula AARII HT, Epoxy resin. (Sand grout will not be accepted).
 1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.

2. Color(s): As selected by Architect from manufacturer's full line.
3. Products:
 - a. Custom Building Products; Polyblend Non-Sanded Grout: www.custombuildingproducts.com/#sle.
 - b. LATICRETE International, Inc; LATICRETE 1600 Unsanded Grout: www.laticrete.com/#sle.
 - c. Merkrete, by Parex USA, Inc; Merkrete Duracolor Non-Sanded Grout: www.merkrete.com/#sle.
 - d. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- B. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
 1. Applications: Where indicated.
 2. Color(s): As selected by Architect from manufacturer's full line.
 3. Products:
 - a. Custom Building Products; CEG-IG 100% Solids Industrial Grade Epoxy Grout: www.custombuildingproducts.com/#sle.
 - b. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com/#sle.
 - c. Merkrete, by Parex USA, Inc; Merkrete Pro Epoxy: www.merkrete.com/#sle.
 - d. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.05 MORTAR MIX AND GROUT MIX

- A. Mix and proportion pre-mix setting bed and grout materials in accordance with manufacturer's instructions and TCA Handbook for Ceramic Tile Installation.

2.06 ACCESSORY MATERIALS

- A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
 1. Crack Resistance: No failure at 1/8 inch gap, minimum.
 2. Fluid or Trowel Applied Type:
 - a. Thickness: 20 mils, maximum.
- B. Waterproofing Membrane -: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
 1. Mortar Bonded Sheet Type:
- C. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 1/2 inch thick; 2 inch wide coated glass fiber tape for joints and corners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

- D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

3.03 INSTALLATION - GENERAL

- A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.19, manufacturer's instructions, and TCNA (HB) recommendations.
- B. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- C. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- D. Form internal angles square and external angles square.
- E. Install non-ceramic trim in accordance with manufacturer's instructions.
- F. Sound tile after setting. Replace hollow sounding units.
- G. Keep control and expansion joints free of mortar, grout, and adhesive.
- H. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- I. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
- J. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
 - 1. Where waterproofing membrane is indicated, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout.

3.05 INSTALLATION - FLOORS - MORTAR BED METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F111, with cleavage membrane, unless otherwise indicated.
 - 1. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCNA (HB) Method F121.
 - 2. Where epoxy bond coat and grout are indicated, install in accordance with TCNA (HB) Method F132, bonded.
 - 3. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install in accordance with TCNA (HB) Method F114, with cleavage membrane.
- B. Cleavage Membrane: Lap edges and ends.
- C. Mortar Bed Thickness: 1-1/4 inch, unless otherwise indicated.

3.06 INSTALLATION - SHOWERS AND BATHTUB WALLS

- A. At shower walls install in accordance with TCNA (HB) Method B411, mortar bed on studs with waterproofing membrane.
- B. Grout with standard grout as specified above.

3.07 INSTALLATION - WALL TILE

- A. On exterior walls install in accordance with TCNA (HB) Method W244, thin-set over cementitious backer units, with waterproofing membrane.
- B. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244. Where indicated on drawings.
- C. At walls where indicated install in accordance with TCNA (HB) Method B411, mortar bed on studs with waterproofing membrane.

3.08 CLEANING

- A. Clean tile and grout surfaces.

3.09 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.
- B. Protect finished installation.

END OF SECTION

**SECTION 09 5100
SUSPENDED ACOUSTICAL CEILINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.
- C. Perimeter trim.

1.02 RELATED REQUIREMENTS

- A. Section 07 2100 - Thermal Insulation: Acoustical insulation.
- B. Section 08 3100 - Access Doors and Panels: Access panels.
- C. Division 23 - HVAC: Air diffusion devices in ceiling.

1.03 REFERENCE STANDARDS

- A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

- A. See Section 01 3000 - "Submittals", for submittal procedures.
- B. Product Data: Provide data on suspension system components and acoustical units.
- C. Samples: Submit two samples 2 by 2 inch in size illustrating material and finish of acoustical units.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - PRODUCT REQUIREMENTS, for additional provisions.
 - 2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.06 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer: Company approved by manufacturer.

1.07 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.
- B.

1.08 EXTRA MATERIALS

- A. Provide one (1) unopened carton of each type of acoustical unit for Owner's use in maintenance of project.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels:

1. Armstrong World Industries, Inc; -: www.armstrongceilings.com/#sle.
 2. CertainTeed Corporation; -: www.certainteed.com/#sle.
 3. USG Corporation; Basis of Design: www.usg.com/ceilings/#sle.
 4. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- B. Suspension Systems:
1. Same as for acoustical units.
 2. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 SUSPENSION SYSTEM MATERIALS

- A. Grid: ASTM C635, intermediate duty, non-fire rated exposed T; components die cut and interlocking.
- 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: Color as selected by Architect.
- 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 with maximum deflection of 1/360.

2.03 ACCEPTABLE MANUFACTURERS - ACOUSTICAL UNITS

- A. Acoustical Tiles: Painted mineral fiber, with the following characteristics:
1. Classification: ASTM E1264 Type III.
 2. Size: 24 by 24 inches.
 3. Thickness: 3/4 inch.
 4. Light Reflectance: 90 percent, determined in accordance with ASTM E1264.
 5. NRC Range: 70 to 75, determined in accordance with ASTM E1264.
 6. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
 7. Tile Edge: Square.
 8. Color: White.
 9. Suspension System: Exposed grid.
 10. Products:
 - a. USG Corporation; Mars, Acoustical Tiles: www.usg.com/ceilings/#sle.
 - 1) Style 86185, Basis of Design.
 - b. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.04 SUSPENSION SYSTEM(S)

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
- B. Exposed Suspension System: Hot-dipped galvanized steel grid with aluminum cap.
1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
 2. Profile: Tee; 15/16 inch face width.
 3. Finish: Baked enamel.
 4. Color: White.
 5. Products:
 - a. USG Corporation; Donn Brand ZXLA 15/16 inch Acoustical Suspension System: www.usg.com/ceilings/#sle.
 - b. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.05 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.
- D. Perimeter Moldings: Same metal and finish as grid.
 - 1. Angle Molding: L-shaped, for mounting at same elevation as face of grid.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - GENERAL

- A. Install system in accordance with manufacturer's instructions and as supplemented in this section.
- B. Install system capable of supporting imposed loads to a deflection of 1/360.
- C. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- D. Hang system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- E. 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.
- F. Center system on room axis leaving equal border units according to reflected ceiling plan.
- G. Do not support components of main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6-inches of each corner; or support components independently.
- H. Do not eccentrically load system, or produce rotation of runners.
- I. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.
- J. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.
- K. Install acoustic units level, in uniform plane, and free from twist, warp and dents.
- L. Install light fixture boxes (where required) constructed of gypsum board above light fixtures in accordance with UL assembly requirements.

3.03 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees (Maximum).

END OF SECTION 09 51 00

**SECTION 09 6519
RESILIENT TILE FLOORING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Installation accessories:
 - 1. Adhesives.

1.02 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants.

1.03 REFERENCE STANDARDS

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.
- B. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine; 2011.
- C. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2017.
- D. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials; 2018.
- E. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2019.
- F. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading; 2017.
- G. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2013a.
- H. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.
- I. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Manufacturer's documentation for flooring and accessories:
 - 1. Technical Data.
 - 2. Installation and Maintenance.
 - 3. Warranty.
 - 4. Safety Data Sheets (SDS) for accessories.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and that the material is of the correct style, color, quantity and run number(s).
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer.

1.06 FIELD CONDITIONS

- A. Acclimate material at jobsite between 65 to 85 degrees F and 35 percent to 85 percent relative humidity for 48 hours prior to installation. Temperature and relative humidity should also be maintained at the same levels during installation, and after installation.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 5 years of documented experience.

1.08 WARRANTY

- A. See Section 01 7700 - Closeout Procedures

1.09 EXTRA MATERIALS

- A. Provide 80 square feet of extra flooring material for owner.
- B. Provide 40 lineal feet of base for each material specified.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Vinyl Tile Manufacturer: Patcraft; phone 800.241.4014; www.patcraft.com
- B. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 RESILIENT TILE FLOORING

- A. Luxury Vinyl Tile: Crossover 1440V
 - 1. Pattern: CROSSOVER LL.
 - 2. Color: as selected by Owner from standard color range..
 - 3. Physical Properties:
 - a. Construction: Phthalate-free solid plank and tile made from 100 percent virgin vinyl.
 - b. Wear Layer Thickness: 20 mil.
 - c. Total Thickness (Gauge): 0.197 inch.
 - d. Finish: ExoGuard.
 - e. Installation: Glue Down, Perimeter Glue.
 - 4. Manufacturing, Performance, and Safety Standards:
 - a. ASTM F1700, Classification: Class III, Type B.
 - b. ASTM D2047, Coefficient of Friction (Dry): Greater than or equal to 0.6.
 - c. ASTM F970, Static Load Limit: Greater than or equal to 1,000 pounds (surpasses requirements).

2.03 ACCESSORIES

- A. Moldings, Transition and Edge Strips: Rubber.
 - 1. Product: S140V, S137V manufactured by Patcraft.
- B. Adhesives:
 - 1. Proprietary Accessory Products: Provide Altro accessories for use with Altro Lavencia Tile:
 - a. Acrylic Adhesive: Ecofix 25 for adhering flooring to substrate.
 - 2. Proprietary Product(s) Standard and Testing:
 - a. Fire Resistance: Flammability exceed minimum for Class 1 rating per ASTM E648.
 - b. Smoke Density: Less than 450 when tested in accordance with ASTM E662.
- C. Wall Base Materials:
 - 1. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set style B, Cove and as follows:
 - a. Height: 4-inch.
 - b. Thickness: 0.125 inch.
 - c. Finish: Satin.
 - d. Color: As selected from manufacturer's standard range.
 - e. Accessories: Premolded external corners and end stops.

PART 3 EXECUTION

3.01 EXAMINATION - SEE ALSO SECTION 01 7000.

- A. Install flooring and accessories after other operations (including painting) have been completed.
- B. Acceptance of Conditions: Carefully examine all installation areas with installer/applicator present, for compliance with requirements affecting work performance.
 - 1. Verify that field measurements, product, adhesives, substrates, surfaces, structural support, tolerances, levelness, temperature, humidity, moisture content level, pH, cleanliness and other conditions are as required by the manufacturer, and ready to receive work.
- C. Verify that substrate is contaminant-free, including old adhesives and abatement chemicals.
- D. Test substrates as required by manufacturer to verify proper conditions exist.
 - 1. Concrete:
 - a. Check for concrete additives such as fly ash, curing compounds, hardeners, or other surface treatments that may prevent proper bonding of floor coverings.
 - b. Moisture testing: Perform either the In-Situ Relative Humidity (RH) test (ASTM F2170) or Moisture Vapor Emission Rate (MVER) test (ASTM F1869). Refer to the Manufacturer's Installation Guide/Manual for the maximum allowable substrate moisture content. Substrates above the maximum allowable moisture content will require a moisture mitigation system.
 - c. Perform alkalinity testing per ASTM F710 to verify pH level is between 7 to 10.
 - d. Check substrate for absorbency per manufacturer's recommendations.
 - e. Perform bond testing per ASTM F710 to determine compatibility of adhesive to concrete substrate.
- E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Flooring installation should not begin until all site conditions have been assessed, testing has been completed and subfloor conditions have been approved.
- B. Prepare per manufacturer's written instructions, Section 01 7000, and as follows:
 - 1. Concrete Substrates: Prepare substrate per ASTM F710.
 - a. Verify that subfloor is clean, flat, smooth, free of dirt, rust, paint, oil, wax or any contaminant that will interfere with adhesive bonding.
 - b. Mechanically remove substrate coatings that are not compatible with adhesives, such as sealers, curing, hardening or parting compounds, soap, wax, oil, etc.
 - 1) Do not use solvents or adhesive removers.
 - c. Expansion joints, isolation joints, or other moving joints must be honored and must not be filled with underlayment products or other materials, and floor coverings must not be laid over them. Expansion joint covering systems should be detailed by the architect or engineer, and based upon intended usage and aesthetic considerations.
 - d. Surface cracks, grooves, depressions, control joints or other non-moving joints, and other irregularities shall be filled or smoothed with high-quality Portland cement or calcium aluminate based patching or underlayment compound for filling or smoothing, or both.
 - 1) Do not skim-coat large areas with patching compound, especially slick power-troweled surfaces.
 - 2) Sand smooth per manufacturer's instructions.
 - e. Slick surfaces such as power-troweled concrete shall be profiled as needed to allow for a mechanical bond between the adhesive and subfloor.
 - f. Do not use gypsum-based underlayment products and do not skim coat concrete subfloors.
 - g. Self-Leveling Underlayments: Provide a dry and smoothly-sanded underlayment substrate ready for installation of Luxury Vinyl Plank & Tile. Underlayment compound shall be moisture-resistant, mildew-resistant, and alkali-resistant and must have a minimum of 3,000 psi compressive strength per ASTM C109/C109M.

- h. Lightweight concrete shall have a compressive strength greater than 90 pounds per cubic foot with minimum compression strength of 2,500 psi or greater.

3.03 INSTALLATION

- A. Installation per manufacturer's written instructions, Section 01 7000, and as follows:
 - 1. Layout shall be specified by Architect, Designer or End User.
 - 2. Follow layout and ensure installation reference lines are square.
 - 3. Field tiles shall be installed with directional arrows on back aligned in the same direction, or may be installed in quarter-turned fashion.
 - 4. Check cartons for and do not mix dye lots.
 - 5. Expansion Joints: Locate expansion, isolation, and other moving joints prior to installation.
 - a. Do not fill expansion, isolation, and other moving joints with patching compound nor cover with resilient flooring.
 - b. Install movement joint systems per manufacturer's instructions and per Section 07 9200.
 - 6. Adhesives: Adhere flooring to substrate using the full spread method resulting in a completed installation without gaps, voids, raised edges, bubbles or any other surface imperfections.
 - a. Select appropriate adhesive, trowel and follow manufacturer's instructions.
 - b. Periodically spot-check transfer of adhesive to back of tile during installation.
 - c. Roll floor with a 100 pound roller to ensure proper transfer of adhesive and bonding.
 - d. Protect floor from traffic per manufacturer's instructions.
 - e. Do not wet mop floor until the adhesive has properly set per written instructions.

3.04 FIELD QUALITY CONTROL

- A. Site tests and inspections:
 - 1. Inspect flooring installation for non-conforming work including (but not limited to) the following:
 - a. Lack of adhesion.
 - b. Bubbles, loose tiles or raised edges.
 - c. Dirt and debris underneath flooring.
 - d. Excessive gaps.
 - e. Improper substrate preparation (as indicated by telegraphing).
 - f. Damage to tiles, including: dents/indentations, cuts, cracks, burns or punctures.
- B. Non-conforming work per General Conditions and as follows:
 - 1. Repair or replace damaged material if not acceptable to the Architect.

3.05 CLEANING

- A. Waste Management per Section 01 7000, and as follows:
 - 1. Coordinate material reclamation program with manufacturer, if applicable.
 - a. Store and return cartons and pallets to manufacturer or recycler for reuse or recycling.
- B. Provide progress cleaning per manufacturer's written instructions, Section 01 7000, and as follows:
 - 1. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the work.
 - a. Clean and protect completed construction until Date of Substantial Completion.
 - b. During installation, remove wet adhesive from surface of flooring per manufacturer's instructions.
 - 2. Site: Maintain project site free of waste materials and debris.
- C. Provide final cleaning immediately prior to Date of Substantial Completion inspection per manufacturer's written instructions and Section 01 7000.

1. Protection: Remove manufacturer's and other installed protection immediately prior to Date of Substantial Completion inspection, unless required otherwise.
2. Clean floor with a neutral 6-8 pH cleaner.

3.06 PROTECTION

- A. Protect materials from construction operations until Date of Substantial Completion or Owner occupancy, whichever occurs first.
 1. Protect finished floor from abuse and damage by using heavy non-staining kraft paper, drop cloths or equivalent. Use additional, non-damaging protective materials as needed.
 2. Light foot traffic on a newly installed floor can be permitted after 24 hours.
 3. Keep heavy traffic and rolling loads off the newly installed LVT flooring for 48 hours.
 4. Protect the floor from rolling loads by covering with protective boards.

END OF SECTION

**SECTION 09 6566
RESILIENT ATHLETIC FLOORING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Rubber tile, adhesively installed.
- B. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

1.03 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016.
- B. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015e1.
- C. SCS (CPD) - SCS Certified Products; Current Edition.
- D. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, layout, and colors.
- D. Selection Samples: Manufacturer's color charts for flooring materials specified indicating full range of colors and textures available.
- E. Verification Samples: Actual flooring material specified, not less than 12 inch square, mounted on solid backing.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer certified in writing by the flooring manufacturer to be qualified for installation of specified flooring system.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.
- B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.07 FIELD CONDITIONS

- A. Maintain temperature at service levels and/or the ambient temperature must remain steady ($\pm 10^{\circ}$ F) between 65° F and 85° F for at least 48-hours prior to, during and until substantial completion.
- B. Maintain relative humidity at service levels, or between 40% and 65% RH.
- C. Avoid conditions in which dew point causes condensation on the installation surface.

1.08 EXTRA MATERIALS

- A. Provide 60 square feet of extra flooring material for owner.
- B. Provide 40 lineal feet of base for each material specified.

PART 2 PRODUCTS

2.01 PREFORMED ATHLETIC FLOORING

- A. Rubber Tile Flooring: Recycled vulcanized rubber and colored granules.

1. Thickness: Minimum 3/8 inch.
2. Tile Edge/Installation: Straight, adhesive installation.
3. Size, Straight Edge Tile: Nominal 27 inches by 27 inches.
4. Durometer Hardness, Type A: Minimum of 70, when tested in accordance with ASTM D2240.
5. Free of tire derived crumb rubber.
6. Surface Texture: Smooth.
7. Color: As selected from manufacturer's standard range.
8. Products:
 - a. Roppe. Tuflex Spartus
 - b. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 ACCESSORIES

- A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.
- B. Flooring Adhesive: Waterproof; types recommended by flooring manufacturer.
- C. Transition: Roppe #74 Rubber rolling transition.
 1. Color: Selected by architect from standard selection.
- D. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove and as follows:
 1. Height: 4-inches.
 2. Thickness: 0.125 inch.
 3. Finish: Satin.
 4. Color: As selected from manufacturer's standard range.
 5. Accessories: Premolded external corners and end stops.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of athletic flooring to substrate.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

- A. Concrete: Use leveling compound as necessary to achieve substrate flatness of plus or minus 1/8 inch within 10 ft radius.
- B. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.
- C. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Rubber Tile Flooring:

1. Lay out center lines in spaces to receive tile flooring, based on location of principal walls. Start tile installation from center, and adjust as necessary to avoid tiles less than one-half width at perimeter.
2. Lay tiles square with room axis, matching for color and pattern by selecting from cartons and mixing as recommended by manufacturer.
3. Spread only enough adhesive to permit installation of materials before initial set.

3.04 CLEANING

- A. Clean flooring using methods recommended by manufacturer.

3.05 PROTECTION

- A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

END OF SECTION

**SECTION 09 6813
TILE CARPETING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

1.03 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2019.
- B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.
- C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.
- D. CRI 104 - Standard for Installation of Commercial Carpet; 2015.
- E. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Submit two, 12" inch long samples of edge strip and base cap.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- E. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - PRODUCT REQUIREMENTS, for additional provisions.
 - 2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.06 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Patcraft:(800) 241-4014 / www.patcraft.com.
- B. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 MATERIALS

- A. Tile Carpeting: Multi-Level Patterned Loop.

1. Style: I0519.
2. Collection: Infrastructure.
3. Tile Size: 24 x 24 inch, nominal.
4. Color: To be selected by Owner from manufacturer's full range.
5. Pattern: Formwork, Scaffold or Transverse - to be selected by owner...
6. Gauge: 1/10 inches.
7. Stitches: 9.83 per inch.
8. Tufted Pile Height: 3/32" low - 5/32" high.
9. Tufted Yarn Weight: 16 oz.
10. Finished Pile Thickness: .107"
11. Density: 7,846.
12. Fiber: EcoSolution Q Nylon.
13. Primary Backing Material: Non-Woven Synthetic.
14. Secondary Backing Material: EcoWorx Tile.

2.03 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Edge Strips: Embossed aluminum, color as selected by Architect.
- C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.
- C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 1. Test as Follows:
 - a. Alkalinity (pH): ASTM F710.
 - b. Internal Relative Humidity: ASTM F2170.
 - c. Moisture Vapor Emission: ASTM F1869.
 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- D. Vacuum clean substrate.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

- E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.
- F. Trim carpet tile neatly at walls and around interruptions.
- G. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

END OF SECTION

**SECTION 09 9113
EXTERIOR PAINTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - 1. Mechanical and Electrical:
 - a. On the roof and outdoors, paint equipment that is exposed to weather or to view, including factory-finished materials.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Non-metallic roofing and flashing.
 - 6. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
 - 7. Floors, unless specifically indicated.
 - 8. Ceramic and other types of tiles.
 - 9. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
 - 10. Glass.
 - 11. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 05 5000 - Metal Fabrications: Shop-primed items.
- B. Section 05 5100 - Metal Stairs: Shop-primed items.
- C. Section 09 9123 - Interior Painting.
- D. Section 22 0553 - Identification for Plumbing Piping and Equipment: Painted identification.
- E. Section 23 0553 - Identification for HVAC Piping and Equipment: Painted identification.
- F. Section 26 0553 - Identification for Electrical Systems: Painted identification.

1.03 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.
- C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2016.
- D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- E. SCAQMD 1113 - Architectural Coatings; 1977 (Amended 2016).
- F. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- G. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 3. Manufacturer's installation instructions.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, submit each color in each sheen available.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
 - 1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- B. Paints:
 - 1. Sherwin-Williams Company; -: www.sherwin-williams.com/#sle.
 - 2. Vista Paint
 - 3. Dunn Edwards; www.dunnedwards.com.
- C. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.

1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 2. Supply each paint material in quantity required to complete entire project's work from a single production run.
 3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. SCAQMD 1113 Rule.
 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Colors: As indicated on drawings.
1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.
 2. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the to match wall and ceiling color.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry units, fiber cement siding, primed wood, and primed metal.
1. Two top coats and one coat primer.
 2. Top Coat(s): Exterior Pigmented Elastomeric, Water Based.
- B. Concrete Floors and Wood Decks to be Painted.
1. Two top coats and one coat primer.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Alkali Resistant Water Based Primer.
 2. Interior/Exterior Latex Block Filler.
 3. Alkyd Primer for Galvanized Metal.

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. 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. Exterior Plaster and Stucco: 12 percent.

2. Fiber Cement Siding: 12 percent.
3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
5. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete:
 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
- G. Masonry:
 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 2. Prepare surface as recommended by top coat manufacturer.
- H. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
- I. Exterior Gypsum Board: Fill minor defects with exterior filler compound. Spot prime defects after repair.
- J. Exterior Plaster: Fill hairline cracks, small holes, and imperfections with exterior patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- K. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- L. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- M. Galvanized Surfaces:
 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- N. Ferrous Metal:
 1. Solvent clean according to SSPC-SP 1.
 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- O. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.
- P. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

- Q. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with tinted primer.
- R. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.
- C. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance.
- F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

3.06 SCHEDULE - PAINT SYSTEMS

- A. Concrete, Concrete Masonry Units (CMU), Concrete Block, Brick Masonry: Finish surfaces exposed to view.
 - 1. One coat block primer. Vista Paint 018 100% Acrylic Block Filler.
 - 2. One coat primer sealer latex. Vista Paint 4600 Uniprime II.
 - 3. One coat latex paint. Vista Paint 3000 Acibond.
- B. Exterior Plaster: Finish surfaces exposed to view.
 - 1. One coat Vista Paint 4600 Uniprime II.
 - 2. Two coats Vista Paint 500 Solotex-100% Acrylic Elastomeric Finish
- C. Fiber Cement Siding: Finish surfaces exposed to view, except _____.
- D. Wood: Finish surfaces exposed to view.
- E. Wood - Transparent:
 - 1. One coat stain. Olympic Stain, Semi-Transparent.
 - 2. One coat sealer. As directed.
- F. Galvanized Steel: Finish surfaces exposed to view, except _____.
 - 1. Pretreatment: Jasco Prep N Prime.
 - 2. One coat zinc chromate primer. Vista Paint 4800 Metal Pro or Carbozinc 90.
 - 3. Two coats acrylic enamel, semi-gloss. Vista Paint 8400 Semi-Gloss or 7900 Premogloss or Carboline 133 VOC.
- G. Steel - Unprimed:
 - 1. One coat zinc chromate primer. Vista Paint 4800 Metal Pro or Carbomastic 90.
 - 2. Two coats acrylic enamel semi-gloss. Vista Paint 8400 Semi-Gloss or 7900 Premogloss or Carboline 133 VOC.

H. Steel - Shop Primed:

1. Touch-up with zinc chromate primer. Vista Paint 4800 Metal Pro or Carbozinc 90.
2. Two coats alkyd enamel semi-gloss. Vista Paint 8400 Semi-Gloss or 7900 Premogloss or Carboline 133 VOC.

I. Pavement Markings:

1. "Laycold Line Paint" or Vista Paint 6900 On-Line Traffic Marking Paint.

END OF SECTION

**SECTION 09 9123
INTERIOR PAINTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Elevator pit ladders.
 - 3. Prime surfaces to receive wall coverings.
 - 4. Mechanical and Electrical:
 - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
 - c. Paint dampers exposed behind louvers, grilles, and convactor and baseboard cabinets to match face panels.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Floors, unless specifically indicated.
 - 6. Glass.
 - 7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 05 5000 - Metal Fabrications: Shop-primed items.
- B. Section 09 9113 - Exterior Painting.
- C. Section 09 9600 - High-Performance Coatings.

1.03 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2016.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- D. SCAQMD 1113 - Architectural Coatings; 1977 (Amended 2016).
- E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- F. SSPC-SP 6 - Commercial Blast Cleaning; 2007.
- G. SSPC-SP 13 - Surface Preparation of Concrete; 1997 (Reaffirmed 2003).

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- C. Samples: Submit two paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - PRODUCT REQUIREMENTS, for additional provisions.
 - 2. Extra Paint and Finish Materials: 3 gallons of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
 - 1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- B. Paints:
 - 1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - 2. Vista Paint: www.vistapaint.com.
 - 3. Dunn Edwards; www.dunnedwards.com.
- C. Transparent Finishes:
 - 1. Vista Paint: www.vistapaint.com.
 - 2. Minwax: www.minwax.com.
- D. Primer Sealers: Same manufacturer as top coats.

- E. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 2. Supply each paint material in quantity required to complete entire project's work from a single production run.
 3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. SCAQMD 1113 Rule.
 - c. Architectural coatings VOC limits of the State in which the Project is located.
 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Colors: As indicated in Color Schedule.
1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.03 PAINT SYSTEMS - INTERIOR

- A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, brick, wood, plaster, uncoated steel, shop primed steel, galvanized steel, aluminum, and acoustical ceilings.
1. Two top coats and one coat primer.
 2. Top Coat(s): Institutional Low Odor/VOC Interior Latex.
 3. Top Coat Sheen:
 - a. Eggshell: MPI gloss level 3; use this sheen as indicated in drawings.
 - b. Semi-Gloss: MPI gloss level 5; use this sheen as indicated in drawings.
 4. Primer: As recommended by top coat manufacturer for specific substrate.
- B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
1. Medium duty applications include doors, door frames, railings, handrails, guardrails, and balustrades.
 2. Two top coats and one coat primer.
 3. Top Coat(s): Interior Alkyd, Water Based; MPI #157, 167, 168, or 169.
 - a. Products:
 - 1) Sherwin-Williams ProMar 200 Waterbased Acrylic-Alkyd, Semi-Gloss.
 - 2) Vista Paint 8400 Carefree Semi-gloss -.
 - 3) Substitutions: Section 01 6000 - PRODUCT REQUIREMENTS.
 4. Top Coat Sheen:
 - a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
- C. Paint I-OP-MD-WC - Medium Duty Vertical and Overhead: Including gypsum board, plaster, concrete, concrete masonry units, uncoated steel, shop primed steel, galvanized steel, and aluminum.
1. Two top coats and one coat primer.
 2. Top Coat(s): Interior Alkyd, Water Based.
 - a. Products:

- 1) Sherwin-Williams ProMar 200 Waterbased Acrylic-Alkyd, Eg-Shel.
 - 2) Sherwin-Williams ProMar 200 Waterbased Acrylic-Alkyd, Gloss.
 - 3) Sherwin-Williams ProMar 200 Waterbased Acrylic-Alkyd, Semi-Gloss.
 - 4) Substitutions: Section 01 6000 - PRODUCT REQUIREMENTS.
- D. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
1. Shop primer by others.
 2. One top coat -.
 3. Top Coat: Alkyd Dry Fall.
 - a. Products:
 - 1) Sherwin-Williams Super Save-Lite Dryfall, Gloss VOC Complying.
 - 2) Substitutions: Section 01 6000 - PRODUCT REQUIREMENTS.
 4. Top Coat Sheen:
 - a. Eggshell: MPI gloss level 3; use this sheen at all locations.
 5. Primer: As recommended by top coat manufacturer for specific substrate.
- E. Paint I-OP-FL - Concrete and Wood Floors to be Painted.
1. Two top coats and one coat primer.
 2. Top Coat(s): Latex Floor Paint, Low Gloss.
 - a. Products:
 - 1) Sherwin-Williams Tread-Plex Acrylic Floor Coating. (MPI #60)
 - 2) Substitutions: Section 01 6000 - PRODUCT REQUIREMENTS.
 3. Top Coat Sheen:
 - a. Eggshell: MPI gloss level 3; use this sheen at all locations.
 4. Primer: As recommended by top coat manufacturer for specific substrate.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Interior Institutional Low Odor/VOC Primer Sealer; MPI #149.
 2. Interior/Exterior Latex Block Filler; MPI #4.

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. 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. Gypsum Wallboard: 12 percent.
 2. Plaster and Stucco: 12 percent.
 3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
 5. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Concrete:
 - 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 - 2. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.
- F. Masonry:
 - 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 - 2. Prepare surface as recommended by top coat manufacturer.
 - 3. Clean surfaces with pressurized water. Use pressure range of 600 to 1,500 psi at 6 to 12 inches. Allow to dry.
- G. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- I. 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.
- J. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- K. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- L. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 - 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- M. Wood Surfaces to Receive Opaque Finish: 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. Back prime concealed surfaces before installation.
- N. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.
- O. Wood Floors: Sand floor and remove any grease or dirt.
- P. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions.

- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- G. Sand wood and metal surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- J. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishin

3.06 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.
- C. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- D. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
- E. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting procedures.

3.07 SCHEDULE - PAINT SYSTEMS

- A. Wood - Painted:
 - 1. One coat alkyd prime sealer. Vista Paint 6600 Aqua Lac.
 - 2. Two coats latex, eggshell. Vista Paint 8300 Carefree Eggshell.
- B. Wood - Transparent:
 - 1. Filler coat (for open grained wood only).
 - 2. One coat stain. VWS Series.
 - 3. One coat sealer. Valspar NAS 1820.
 - 4. One coat varnish satin. Valspar NAS 1822.
- C. Wood - Transparent - Floor
 - 1. Two-Three coat sealer:. Minwax Ultra Fast Drying Polyurethane for Floors, Satin finish.
- D. Concrete:
 - 1. One coat block filler. Vista Paint 018 100% Acrylic Block Filler.
 - 2. One coat primer sealer latex. Vista Paint 4600 Uniprime II
 - 3. One coat latex, eggshell. Vista Paint 8300 Carefree Eggshell.
- E. Steel - Unprimed:

1. One coat zinc chromate primer. Vista Paint 4800 Metal Pro.
 2. Two coats semi-gloss. Vista Paint 8400 Carefree Semi-Gloss or Rust-Oleum Sierra S70 or S71 Primer and Rust-Oleum Sierra S22 Finish.
- F. Steel - Primed:
1. Touch-up with original primer. Vista Paint 4800 Metal Pro.
 2. Two coats semi-gloss. Vista Paint 8400 Carefree Semi-Gloss or Rust Oleum Sierra S70 or S71 Primer and Rust-Oleum Sierra S22 Finish.
- G. Steel - Galvanized:
1. Pretreatment: Jasco Prep N Prime.
 2. One coat zinc chromate primer. Vista Paint 4800 Metal Pro.
 3. Two coats semi-gloss. Vista Paint 8400 Carefree Semi-Gloss or Rust-Oleum Sierra S70 or S71 Primer and Rust-Oleum Sierra S22 Finish.
- H. Plaster, Gypsum Board
1. One coat alkyd primer sealer. Vista Paint 1100 High Build PVA.
 2. Two coats alkyd enamel, eggshell. Vista Paint 8300 Carefree Eggshell.

END OF SECTION

**SECTION 09 9623
ANTI GRAFFITI COATING SYSTEM**

PART 1 GENERAL

1.01 SUMMARY:

- A. Description: This Section includes the application of an anti-graffiti coating system to protect the above-grade exterior surfaces including, but not limited to:
 - 1. Stained or "specially finished" concrete (as indicated on elevations)
 - 2. CMU walls (as indicated on elevations)
- B. Coatings: As used herein, means all graffiti resistant coating system materials, including base coatings and top coating required to achieve the performance requirements of this Section
 - 1. Clear (transparent) graffiti resistant coating.

1.02 SECTION INCLUDES:

- A. Section 03 3000 - Cast-In-Place Concrete
- B. Section 04 2200 - Unit Masonry

1.03 REFERENCES:

- A. Coatings must comply with South Coast Air Quality Management District (SCAQMD) Rule 1168 VOC limits. OR RULE 1113 IS THE APPLICABLE SCAQMD RULE RE ARCHITECTURAL COATINGS AND IS PROBABLY MORE APPROPRIATE UNLESS SOME SPECIAL NEED TO REFER TO ADHESIVES AND SEALANTS.
- B. ASTM D2369-92 - Test methods for Volatile Contents of Coatings.
- C. ASTM D3960-93 - Practice for Volatile Organic Compounds (VOC) Contents of Paints and Related Coatings.
- D. ASTM B-1 17 and ASTM D-714 (Salt spray Test): 10,000 Hours.
- E. ASTM D-522 (Flexibility Strength Test): Pass 3/8" mandrel.
- F. ASTM D-968 (Abrasion Test): 10 liters of sand to abrade 1 mil of dry coating.
- G. Test): Vapor is transmitted.
- H. ASTM D-3359-90 (Adhesion Test): 5A
- I. ASTM D-610-85 (Rust): Less than 0.03% degradation.
- J. SCAQMD - Rule 1168

1.04 SYSTEM DESCRIPTION

- A. Base coating and graffiti resistant top coating shall each be a permanent coating system.
- B. Product shall be suited to architectural aesthetics of substrate and shall come in clear or color with a choice of finishes including dead flat, semigloss, or high gloss.
 - 1. Finishes-must be measurable on a 60 degree meter to read not greater than:
 - a. 5 flat finishes
 - b. 45 to 55 for semigloss finishes
 - c. not less than 75 for high gloss finishes
- C. Anti-graffiti coating shall show no signs of deterioration or change of appearance after graffiti has been removed during the 20-year warranty period: i.e., no shadowing, ghosting, or staining of coating or substrate.
- D. Anti-graffiti coating shall be non-yellowing, non-chalking, and UV resistant S. Graffiti removal product shall be non-toxic, non-flammable, biodegradable, and with a neutral pH with a range between 7.0 and 8.5.
- E. Anti-graffiti coatings shall be AQMD/VOC compliant.

1.05 SUBMITTALS

- A. Product data: Submit manufacturer's product data sheets on products to be used for the Work.
 - 1. Base Coating.
 - 2. Anti-graffiti top coating.
 - 3. Graffiti removal agent.
- B. Applicator Qualifications
 - 1. Manufacturer's certification or pre-training letter approving of applicator or willingness to train applicator if awarded sub-contract for this anti-graffiti portion of the work.

1.06 MOCK-UP TEST PANEL

- A. Apply base coating and graffiti resistant top coating to test areas to determine number of coats, coverage rates, compatibility, effectiveness, surface preparation, application procedures, and desired results.
- B. Test Panel Requirements:
 - 1. Area: Minimum 4 feet by 4 feet.
 - 2. Locations: As determined by Owner
 - 3. Each type of substrate that will be protected

1.07 QUALITY ASSURANCE

- A. Applicator
 - 1. Applicator shall be experienced in coating applications, and shall be currently a Certified Applicator in Good Standing and/or will become certified per the Manufacturer's training procedures during the project with the graffiti resistant coatings as specified in this section.
- B. Pre-Application Meeting: Convene a pre-application meeting before the start of application of graffiti resistant coating. Require attendance of parties directly affecting Work of this Section, including the General Contractor, Owner, Certified Applicator, and Manufacturer's Representative. Review environmental regulations, test panel procedures, protection of the surrounding areas and non-masonry surfaces, surface preparation, application, field quality control, final cleaning, and coordination with other Work.
- C. Single Source Responsibility: Same manufacturer will supply base coatings, top coatings and all removal agents.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, bearing manufacturer's name label with the following information:
 - 1. Name of the material.
 - 2. Manufacturer's stock number and date of manufacture.
 - 3. Manufacturer's name.
 - 4. Contents by volume for major pigment and vehicle constituents.
 - 5. Application instructions.
- B. Protect from freezing where necessary. Keep storage area neat and orderly. Remove flammable rags and waste daily. Take precautions to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing, and application of coatings.

1.09 PROJECT/SITE CONDITIONS

- A. Temperature Limitations:
 - 1. Apply water-based coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 45 degrees F and 95 degrees F, unless permitted by paint manufacturer's printed Instructions.

2. Apply solvent-based coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 45 degrees F and 95 degrees F, unless permitted by paint manufacturer's printed instructions
- B. Apply per manufacturer's Instructions.
- C. Do not apply under windy conditions such that base coating and/or graffiti resistant coating may be blown to surfaces not other than those being treated.
- D. Do not apply earlier than 24 hours after rain, snow, fog, or mist if same is predicted for a period of 12 hours after application.
- E. This specification, the manufacturer's specifications, and MSDS sheets are to be on the job site during application. Applicators shall be thoroughly familiar with their content.

1.10 WARRANTY

- A. Warranty shall cover the original purchaser or property owner for a period of twenty (20) years from the date of Grand Opening.
- B. Manufacturer shall warrant the performance for its products for the warranty period and the removal of graffiti defacement, chemical staining, ghosting, shadowing and normal environmental effects, without exception, and shall retain reasonable gloss and color stability so long as product is applied according to the manufacturer's recommendations. Warranty shall be issued only upon successful application of the products and verification that products were properly applied by showing successful graffiti removal. Once warranty is issued, manufacturer will bear responsibility for repair, remediation of any substrate and replacement of coatings if there is a failure of the products to protect the substrates and the coatings from damage from graffiti. Manufacturer shall not be responsible for water conditions, structural defects, damage to coatings from external forces, or similar causes.

1.11 INSTRUCTIONS

- A. Subcontractor shall provide demonstration of cleaning procedure per manufacturer's Instructions to tenant's or property owner's representative after completion of application and surface has properly cured. Owner will coordinate the meeting.

1.12 MAINTANENCE

- A. Extra Products: Furnish the following extra products: Graffiti removal agent -- One and one-half (1.5) gallons per 2,500 square feet of covered area. GSS TYPICALLY PACKAGES IN A SINGLE CASE – TWELVE 16oz. bottles which equals 1.5 gallons.
 1. Removal agent shall be packaged in 16 to 32 oz. bottles and boxed for storage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Graffiti resistant coating shall be a clear, non-sacrificial graffiti resistant coating which provides protection for exterior vertical surfaces from permanent graffiti staining and damage caused by any type of commercially available spray or other paint, stains, inks, and marking pens.
Coating shall be suitable for application to painted and unpainted surfaces including masonry, concrete, metals, and EIFS. Product shall be a coating that dries clear, non-yellowing, non-chalking with a sheen of <5° on the Gardner Gloss Meter for flat finish top coats.
 1. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide the following products as manufactured by GSS Coatings, LLC, South Jordan, UT; 801-255-9505. www.gsscoatings.com . or approved equal (any submittals for alternates must be made and approved prior to bid).
 - a. Base Coat: GSS-307 Base Coat
 - b. Top Coat: GSS-100 Top Coat or other related top coats depending on required sheen and/or tint.
 - c. Cleaning Solution: GSS-400 ERASOL Graffiti Cleaning Solution

- B. Water Repellant (For first coat on unpainted concrete and masonry surfaces): GSS-500 Aqua-Lock WB Water Repellent & Concrete Sealer.

2.02 MATERIAL CHARACTERISTICS

- A. Anti-graffiti coatings shall be multi-component, multi-coat coating system. Single component systems are not acceptable.
- B. Anti-graffiti coating shall not contain paraffin (wax) or elastomeric silicones.
- C. Anti-graffiti coating shall have the capability of having all types of paints and graffiti materials (currently known to the general public) completely removed without damaging the anti-graffiti top coating, the base coating or the substrate.
- D. Removal agent shall be non-toxic, non-flammable, biodegradable, and have a pH 7 to 8.5. After removal is complete, no evidence of graffiti shall be present.
- E. The removal of graffiti material shall not cause a change in the appearance of the treated surface for the period of the warranty; i.e., there shall be no shadowing, ghosting, or staining of coating or substrate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Applicator shall examine areas and conditions under which anti-graffiti coating is to be applied. Applicator shall notify General Contractor and Owner in writing of conditions detrimental to proper and timely completion. Applicator to ensure that any acidic cleaner has been removed and that substrates to be treated are free of contaminants and are pH neutral prior to application of anti-graffiti coatings. Applicator shall not proceed with Work until unsatisfactory conditions have been corrected.
- B. Commencement of coating work shall be construed as Applicator's acceptance of surfaces and conditions within any particular area and Applicator's representation that the surface has been properly treated, cleaned, or repainted.
- C. Unpainted Concrete and Masonry: Verify water repellant has been applied in accordance with Section 071900 to new or non-painted concrete and masonry surfaces prior to the application of the anti-graffiti coating.
- D. Do not apply over dirt, rust scale, grease, moisture, or conditions otherwise detrimental to formation of a durable base coating

3.02 PREPARATION

- A. General: Perform preparation and cleaning procedures with coating manufacturer's instruction and as herein specified for each particular substrate condition.
- B. Repair, patch, and fill cracks, voids. Defects and damaged areas in surface as approved by the Owner.
- C. Allow repair materials to cure completely before application of graffiti resistant coatings.
- D. Apply specified sealant and caulking and allow to each cure completely before application of graffiti resistant coatings.
- E. Seal all open joints with sealant approved for substrate and acceptable by coatings manufacturer.
- F. Allow masonry, concrete construction and repainted surfaces to cure completely before applying graffiti resistant coatings.

3.03 APPLICATION

- A. General: Apply anti-graffiti coating in accordance with manufacturer's directions. Use application techniques best suited for substrate and type of material to be applied.

- B. Applicator shall know the substrate that is to be coated and understand the porosity, texture, and general conditions that will be present during the application to provide a correct bid and choose correct product acquisition. Applicator responsible for ensuring that correct wet and dry mil thicknesses achieved as per manufacturer's specifications.
- C. Do not dilute anti-graffiti products, materials shall be used direct from the manufacturer's containers.
- D. Mix anti-graffiti coatings two-component products at ratio stated by the manufacturer.
- E. Applicator shall use caution when spraying coatings. Applicator shall wear a respirator with an organic vapor cartridge. Avoid over-spray and spillage. Mask all windows, move vehicles, cover air intakes, cover vegetation, place barriers to keep pedestrians away from the spraying materials. Applicator shall make sure there is adequate ventilation. Applicator should use an air line respirator if ventilation is not adequate.
- F. Do not apply in windy conditions.

3.04 APPLICATION RATES

- A. Base Coatings:
 - 1. All base coatings require an application of at least two (2) coats on all surfaces. If two (2) coat does not result in a continuous, pin-hole free coating, additional coats must be applied until a pin-hole free surface is achieved.
 - 2. Allow a minimum of 24 hours between base coatings and anti-graffiti top coating.
 - 3. Anti-graffiti top coatings require an application of at least two (2) coat on all surfaces. (With the exception of split face block. Please contact manufacturer.) Dry mil thickness of 3.5-4 anti-graffiti top coating must be achieved per manufacturer's specifications.
- B. Apply at 3.5 - 4.0 mils dry (7.0 - 8.0 mils wet) per coat to achieve optimal performance.
- C. Apply coatings in a crosshatch pattern. One vertical pass and one horizontal pass are considered one coat.
- D. Back roll base coating when applying to an uneven or textured substrate to achieve a continuous pinhole free surface.
- E. Top coating may not require back rolling. Consult with manufacturer.

3.05 FIELD QUALITY CONTROL

- A. Inspection: Inspect the graffiti resistant coatings Work with the General Contractor, Owner, and Applicator and compare with test panel results accepted by the Owner. Subcontractor to comply with manufacturer's requirements for issuance of warranty.
- B. Touch-up Work: Surface areas determined to be un-coated or not consistent with desired finish shall be repaired per manufacturer's written instruction.
- C. Manufacturer's Field Services: Provide the services of a manufacturer's authorized representative to verify specified products are used, and protection, surface preparation, and application of graffiti resistant coatings are in accordance with the manufacturer's written instructions and the test panel results accepted by the Owner.

3.06 CLEANING

- A. Clean site of all unused graffiti resistant coatings, residues, rinse water wastes, and effluent in accordance with environmental regulations.
- B. Remove and dispose of all materials used to protect surrounding areas and non-masonry surfaces, following completion of the Work of this Section.
- C. Repair, restore, or replace to the satisfaction of the, all materials, landscaping, and non-masonry surfaces damaged by exposure to graffiti resistant coatings.

END OF SECTION

SECTION 10 1400 SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Room and door signs.
- B. Building identification signs.

1.02 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
 - 1. Provide engineered shop drawings for letters mounted on top of Entry Canopy.
- C. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
- D. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
- E. Manufacturer's Qualification Statement.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

- A. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Flat Signs:
 - 1. Best Sign Systems, Inc; -: www.bestsigns.com/#sle.
 - 2. Cosco Industries (ADA signs); ADA Series 1: www.coscoarchitecturalsigns.com/#sle.
 - 3. Inpro; -: www.inprocorp.com/#sle.
 - 4. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- B. Dimensional Letter Signs:
 - 1. Gemini Signs, Inc.
 - 2. Cosco Industries: www.coscoarchitecturalsigns.com/#sle.
 - 3. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 SIGNAGE APPLICATIONS

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1CBC 2019, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
 - 1. Sign Type: Flat signs with - panel media as specified.
 - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
 - 3. Character Height: 1 inch.
 - 4. Sign Height: 2 inches, unless otherwise indicated.
 - 5. Office Doors: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section for replaceable occupant name.
 - 6. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section with sliding "In Use/Vacant" indicator.
 - 7. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
 - 8. Rest Rooms: Identify with pictograms, the names "ALL-GENDER RESTROOM", and braille.
- C. Building Identification Signs:
 - 1. Use individual metal letters.
 - 2. Mount on outside wall in location indicated on drawings.

2.03 SIGN TYPES

- A. Flat Signs: Signage media without frame.
 - 1. Edges: Square.
 - 2. Corners: Square.
 - 3. Wall Mounting of One-Sided Signs: Concealed or exposed screws.
 - 4. Door Mounted: Tape adhesive
- B. Color and Font: Unless otherwise indicated:
 - 1. Character Font: Helvetica, Arial, or other sans serif font.
 - 2. Character Case: Upper case only.
 - 3. Background Color: Clear.
 - 4. Character Color: Contrasting color.

2.04 TACTILE SIGNAGE MEDIA

- A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
 - 1. Total Thickness: 1/8 inch.
- B. Injection Molded Panels: One-piece acrylic plastic, with raised letters and braille.
 - 1. Total Thickness: 1/8 inch.
- C. Applied Character Panels: Acrylic plastic base, with applied acrylic plastic letters and braille.
 - 1. Total Thickness: 1/4 inch.
 - 2. Letter Thickness: 1/8 inch.
 - 3. Letter Edges: Square.

2.05 DIMENSIONAL LETTERS

- A. Metal Letters:
 - 1. Metal: Bronze casting.
 - 2. Metal Thickness: 1/8 inch minimum.
 - 3. Depth: 1/2 inch min.
 - 4. Letter Height: As Indicated
 - 5. Text and Typeface:

- a. Character Font: Avant Gard.
 - b. Character Case: Upper case only.
- 6. Finish: Baked Enamel.
- 7. Mounting: Concealed screws.
- B. Metal Letters:
 - 1. Flat Cut Metal: Aluminum, 5052 Alloy/5083 Alloy.
 - 2. Finish: Baked Enamel, bead blast returns, sprayed with acrylic polyurethane, baked.
 - 3. Mounting: Stud mounted per engineering requirements for site location and weather conditions.
 - 4. Text and Typeface:
 - a. Character Font: Avant Gard
 - b. Character Case: Upper case only

2.06 ACCESSORIES

- A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
- B. Exposed Screws: Stainless steel.
- C. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Locate signs where indicated:
 - 1. If no location is indicated obtain Owner's instructions.
- D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

**SECTION 10 2600
WALL AND DOOR PROTECTION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Corner guards.
- B. Protective wall covering.
- C. Metal wall panels

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Blocking for wall and corner guard anchors.
- B. Section 09 2116 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- B. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2018c.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate physical dimensions and features.
- C. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Corner Guards:
 - 1. Inpro; -: www.inprocorp.com
 - 2. Pawling Corp. www.pawling.com/#sle.
 - 3. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- B. Protective Wall Covering:
 - 1. Inpro; -: www.inprocorp.com/#sle.
 - 2. Pawling Corp; -: www.pawling.com/#sle.
 - 3. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 PRODUCT TYPES

- A. Corner Guards: Type 1-Surface Mounted
 - 1. Material: High impact vinylwith full height vinyl retainer.
 - a. Basis of Design: BullNose High Impack Corner Guard, Manuf. Inpro Corp. 0.080 thk
 - 2. Width of Wings: 2 inches.
 - 3. Corner: Square.
 - 4. Color: As selected from manufacturer's standard colors.
 - 5. Length: One piece.
- B. Corner Guards: Type 2 -Surface Mounted: Stainless Steel, screw attached
 - 1. Material: 304, 16 ga.
 - 2. Width of wings: 3 inches min.

2.03 FABRICATION

- A. Fabricate components with tight joints, corners and seams.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.
- B. Verify that substrate surfaces for adhered items are clean and smooth.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Position corner guard 4 inches above finished floor to 4' inches high.

3.03 SCHEDULE

- A. Living quarters, Offices: Type 1 Corner guards.
- B. Apparatus #2: Type 2 Corner guards.

END OF SECTION

**SECTION 10 2800
TOILET AND BATH ACCESSORIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Commercial shower and bath accessories.
- C. Attachment hardware.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000: Rough Framing, concealed supports for accessories, including in wall framing and plates.
- B. Section 08 8000 - Glazing: Wall mirrors.

1.03 REFERENCE STANDARDS

- A. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; '08.
- B. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low Alloy, High-Strength Low Alloy with Improved Formability, Solution Hardened and Bake Hardenable; '09.
- C. ASTM B456/ASTM B456M - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; '03.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- E. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a.
- F. ASTM C1036 - Standard Specification for Flat Glass; 2016.
- G. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.

1.04 SUBMITTALS

- A. See Section 01 3000 - "Submittals", for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Submit manufacturer's installation instructions.

1.05 KEYING

- A. Supply 4 keys for each accessory to Owner.
- B. Master key all accessories.

1.06 SEQUENCING AND SCHEDULING

- A. Coordinate the work of this Section with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Substitutions and Product Options: Under provisions of Section 01 60 00 - "Product Requirements".
- B. Commercial Toilet, Shower, and Bath Accessories:
 - 1. Bobrick
 - 2. American Specialties, Inc: www.americanspecialties.com/#sle.

3. Bradley Corporation: www.bradleycorp.com/#sle.
- C. Shower Receptors:
 1. Florestone: www.florestone.com, Ph 800.446.8827.

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
- B. Sheet Steel: ASTM A1008/A1008M.
- C. Stainless Steel Sheet: ASTM A167, Type 304.
- D. Tubing: ASTM A269, stainless steel.
- E. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
- G. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 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.

2.04 FACTORY FINISHING

- A. Galvanizing: ASTM A123.
- B. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.
- C. Chrome/Nickel Plating: ASTM B456, Type SC 2 satin finish.
- D. Stainless Steel: No. 4 satin luster finish.

2.05 COMMERCIAL SHOWER AND BATH ACCESSORIES

- A. Terrazzo Shower Receptor:
 1. Florestone
 - a. Model 200 recess.
 - b. Size: 36" x 42".
 - c. For use in Living Quarters' bathrooms.
- B. Shower Door:
 1. Manufacture: Century Shower Doors, 20100 Normandie Ave., Torrance CA 90502
Ph: (800) 824-9350, www.showerdoor.com.
 2. Model #1000 SL.
 - a. Standard Features:
 - 1) Metal Finishes - Silver.
 - 2) Glass - safety tempered, clear.
 - 3) Highly buffed, premium weight aluminum framing.
 - 4) "Easy-clean", L-shaped track.
 - 5) Size to fit opening. Min. door opening 30".
 - 6) Provide side panel where indicated in plans.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings.
- B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.
- C. Verify exact location of accessories for installation.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
 - 1. Grab Bars: As indicated on drawings.

3.04 SCHEDULE

- A. Grab Bars: ASI or Bobrick, or as approved by Architect, 1-1/4-inch round section, forged brass, concealed fastenings, polished chrome finish. ASI #3100, Series B-5806, 18-inches, 36-inches and 42-inches.
- B. Robe Hooks: ASI #7345, Bobrick #B-7672, double robe hook, bright stainless steel finish, or as approved by Architect.
- C. Towel Bars: (24-inches & 30-inches - see interior elevations and Reference Plan). ASI #7360, Bobrick B-205 Series, Heavy duty towel bar, stainless steel satin finish, or as approved by Architect.
- D. Recessed Soap Dish: Bobrick #B-4380, (7-3/16" W x 5" H) Type 304 stainless steel recessed heavy-duty soap dish or as approved by Architect. .
- E. Mirror:
 - 1. Bobrick #B-290 2436 Channel Framed Mirror.
 - a. Type 304 satin-finish stainless steel shelf.
 - b. For use above wall mounted lavatory.
 - 2. Mirror with D645, CRL Polished Finish 1/4" deep nose, "J" channel trim as distributed by CR Laurence, Co., Inc. Field Verify Sizes.
 - a. 36 inch W x 44 inch H
 - b. For use above bathroom casework.
- F. Baby Changing Station: Koala Kare Products, KB301, Horizontal wall mounted baby changing station.
 - 1. Location: Administration building restroom, as indicated in pl.

END OF SECTION

**SECTION 10 4116
RAPID ENTRY SYSTEM**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Rapid Entry System (Key Lock Box).

1.02 REFERENCE STANDARDS

- A. Federal Specification TT-C-490D - Cleaning Methods for Ferrous Surfaces and Pretreatments for Organic Coatings, '93.
- B. UL - Underwriters Laboratories, Inc.

1.03 SUBMITTALS

- A. See Section 01 3000 - "Submittals", for submittal procedures.
- B. Product Data: Provide manufacturer's product information, including installation instructions.

1.04 QUALITY ASSURANCE

- A. Final acceptance will be contingent upon compliance with Fire Department requirements.
- B.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. KNOX-BOX, 3200 Series, with hinged door, recessed with optional alarm tamper switch.
 - 1. Lock: UL listed. Double-action rotating tumblers and hardened steel.
 - 2. Finish: Pre-treatment, zinc-phosphate to Federal Standard TT-C-490D Type II.
 - a. Final coating - weather resistant interior and exterior TGIC polyester powder coat.
 - b. Color: As selected by Architect.
 - c.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions and as approved by the Fire Department.

END OF SECTION 10 41 16

**SECTION 10 4400
FIRE PROTECTION SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
- B. NFPA 10 - Standard for Portable Fire Extinguishers; 2017.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide extinguisher operational features.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Potter-Roemer: www.potterroemer.com/#sle.
 - 2. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- B. Fire Extinguisher Cabinets and Accessories:
 - 1. Activar Construction Products Group, Inc. - JL Industries; Clear Vu Series: www.activarcpg.com/#sle. Basis of Design.
 - 2. Potter-Roemer; -: www.potterroemer.com.
 - 3. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Class: A:B:C type.
 - 2. Size: 5 pound.
 - 3. Temperature range: Minus 65 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

- A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.
- B. Cabinet Construction: Non-fire rated.
 - 1. Formed galvanized steel sheet; 0.036 inch thick base metal.
- C. Cabinet Configuration: Semi-recessed type.
 - 1. Size to accommodate accessories.
 - 2. Trim: Flat square edge, with 1-1/4 inch wide face.
- D. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.
- E. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, full view bubble shape and set in resilient channel glazing gasket.
- F. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.

1. Exterior of building and in Apparatus 1 and 2: Provide stainless steel finish.
2. Interior FE Cabinets: Finish to be Powder Coated steel, color white.

2.04 ACCESSORIES

- A. Cabinet Signage: As required by local fire department.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, at height indicated.
- C. Place extinguishers in cabinets.

END OF SECTION

**SECTION 10 5143
TURNOUT GEAR STORAGE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall mounted Turnout Gear Storage with hooks and shelves.

1.02 RELATED REQUIREMENTS

- A. 06 10 53 - Wood Blocking and Curbing: In-wall framing and plates.

1.03 SUBMITTALS

- A. See Section 01 3000 - "Submittals", for submittal procedures.
- B. Product Data: Provide manufacturer's product data including installation instructions.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and protect products in accordance with Section 01 60 00 - "Product Requirements".

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

- A. Basis of Design Manufacturer: GearGrid LLC, 670 SW 15th St., Forest Lake, MN 55025. .
www.greagrid.com; ph 888-643-6694.
- B. Other Acceptable Manufacturers:
 - 1. Cogan Wire and Metal Products, Ltd.; www.cogan.com
 - 2. Ready Rack; www.readyrack.com
 - 3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PRODUCT

- A. Geargrid Wall Mount Lockers.
 - 1. Size: "Jumbo" - 24"W x 24"D x 74-1/2"H.
 - 2. Shelves and Hooks: Two (2) shelves constructed of high-strength 1/4" wire, and three (3) apparel hooks per locker.
 - 3. Adjustability: Wire shelves adjustable in 3" increments.
 - 4. Frame: Heavy-duty 1-1/4" tubing.
 - 5. Side and Back Grids: High-strength 1/4" wire.
 - 6. Name Plate: 20 gauge sheet metal, accepts 2" x 18" custom printed tag.
 - 7. Mounting Brackets: 11 gauge steel.
 - 8. Finish: Durable powder coat.
- B. Geargrid Free-Standing Units-Floor mounted
 - 1. Locker Sizes:
 - a. Jumbo 24" x 24" deep, 83" height
 - 2. Shelves and Hooks: Two (2) shelves (top and bottom) constructed of high-strength 1/4" wire, and three (3) apparel hooks per locker.
 - 3. Frame: Heavy-duty 1-1/4" tubing.
 - 4. Side and Back Grids: High-strength 1/4" wire.
 - 5. Mounting Brackets: 11 gauge steel.
 - 6. Finish: Durable powder coat.

2.03 ACCESSORIES

- A. Provide the following accessories for each individual locker:

1. Horizontal hang bar.
2. GearHange.
 - a. Coat Drying Hanger
3. Secure Door.
 - a. Top cover
4. Placard Channel: 20 gauge steel to accept a 2" x 12" name placard.

2.04 FINISH

- A. General: All system components excluding assembly and mounting hardware and stainless steel components are to receive the standard finish.
- B. B. Standard Finish: Components to be cleaned using a phosphatized bath, clear water rinse and electro-statically coated with a durable and UV-stable TGIC powder coating process. Thickness of applied finish shall be 3 – 4 mm for added protection.
- C. 1. Anti-Corrosive Primer: (Optional)
- D. C. Color: as selected from standard range (Manufacturer must provide a minimum 7 standard color choices for selection).

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install lockers secure, plumb, square and in line.
- C. Anchor lockers with appropriate anchor devices to suit materials encountered.

END OF SECTION 10 51 43

**SECTION 10 5500
POSTAL SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Curbside mail box

1.02 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. 39 CFR 111 - U.S. Postal Service Standard 4C; Current Edition.
- C. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's specifications and descriptive literature, installation instructions, maintenance information, and current USPS approval documentation.

PART 2 PRODUCTS

2.01 CENTRAL MAIL DELIVERY BOXES

- A. Manufacturers:
 - 1. Salsbury Industries: www.mailboxes.com/#sle.
 - 2. Mail Boss. Epoch Design LLC, www.mailboss.com, Ph 800.589.7990
 - 3. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- B. Curbside Pedestal Mounted Mailbox: Provide products approved for United States Postal Service (USPS) delivery.
 - 1. Basis of Design: Mailboxes.com, Salsbury 4300 Series Roadside Mailbox
 - 2. Model: 4325 locking
 - 3. Provide inground mounted post-4385

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that concrete base and anchor bolts are ready to receive pedestal-mounted units.
- B. Do not begin installation until unacceptable conditions are corrected.

3.02 INSTALLATION

- A. Install postal specialties in accordance with approved shop drawings, manufacturer's instructions, and USPS requirements.
- B. Adjust and lubricate door hardware to operate properly.

END OF SECTION

SECTION 10 7500 FLAGPOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum Flagpoles.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete base and foundation construction.

1.03 REFERENCE STANDARDS

- A. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2016.
- B. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles; 2007.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pole, accessories, and configurations.
- C. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Design flagpole foundation under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed the State in which the Project is located.
 - 1. Provide stamped and signed shop drawing for deferred permit submittal.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Flagpoles:
 - 1. Bolander and Sons. www.bolanderflagpole.com; phone 800.434.0279
 - 2. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 FLAGPOLES

- A. Flagpoles: Designed in accordance with NAAMM FP 1001
 - 1. Bolander and Sons; Extra Heavy Ground Set Cone Tapered Aluminum
 - 2. Material: Aluminum.
 - 3. Design: Cone tapered.
 - 4. Mounting: Ground mounted type.
 - 5. Outside Butt Diameter: 5 inches.
 - 6. Nominal Wall Thickness: .156 inches.
 - 7. Nominal Height: 30 ft; measured from nominal ground elevation.
 - 8. Halyard: Interior type.
- B. Performance Requirements:
 - 1. Wind Pressure Loading on Flagpole with Flag: Resistant without permanent deformation to 130 miles/hr wind speed, in accordance with NAAMM FP 1001.

2.03 POLE MATERIALS

- A. Aluminum: ASTM B241/B241M , 6063 alloy , T6 temper.

2.04 ACCESSORIES

- A. Finial Ball: Stainless steel, 6 inch diameter.
- B. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.
- C. Halyard: 5/16 inch diameter polypropylene, braided, white.

2.05 OPERATORS

- A. Hand Crank: Removable locking cover cam type.

2.06 FINISHING

- A. Aluminum: Anodized to Class 1, Clear color.
- B. Finial: Gold anodized finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

- A. Install flagpole , base assembly, and fittings in accordance with manufacturer's instructions.

3.03 TOLERANCES

- A. Maximum Variation From Plumb: 1 inch.

3.04 ADJUSTING

END OF SECTION

**SECTION 11 3013
RESIDENTIAL APPLIANCES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Kitchen appliances.
- B. Laundry appliances.
- C. Ice machine / bin.

1.02 RELATED REQUIREMENTS

- A. Section 22 - Plumbing: Plumbing connections for appliances.
- B. Section 26 - Electrical: Electrical connections for residential equipment.

1.03 SUBMITTALS

- A. See Section 01 3000 - "Submittals", for submittal procedures.
- B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
- C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.
- C. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

- A. Refridgerator: One (1) each, True T-49-HC Reach-In Solid Two-Door Refrigerator
 - 1. Cabinet Dims: 54-1/8" x 29-1/2" x 78-3/8"
 - 2. Energy Star Qualified
 - 3. Stainless steel finish
 - 4. Heavy duty PVC coated wire shelves
- B. Freezer: One (1) each, True T-49F-HC Reach-In Solid Door Freezer
 - 1. Cabinet Dims: 27" x 29-1/2" x 78-3/8"
 - 2. Energy Star Qualified
 - 3. Stainless steel finish
 - 4. Heavy duty PVC coated wire shelves
- C. Range : Natural gas, free-standing sealed burners.
 - 1. Wolf Model GR486c, One (1) each.
 - 2. Color: Stainless Steel
 - 3. Size: 48 inches wide.
 - a. Burners-6; griddle-12"
- D. Cooking Exhaust: Range hood.
 - 1. Wolf Model PW482718 One (1) each, Color: Stainless steel
 - a. Size: 48 inches wide.
 - b. Fan: Variable- speed, 600 + cfm. Internal.

- c. Lighting: Two 75 Watt Bulbs.
 - d. Exhaust: 10" Round
 - e. Filters: Dishwasher safe full coverage filters.
 - f. Duct Covers: 48" Pro Wall Hood Duct Covers
 - 1) Length: As required to cover exhaust duct.
- E. Microwave : Countertop, Two (2) each - Panasonic
 - 1. Model: Cyclonic Wave Inverter, 1250W-NN-SN74P
 - 2. Capacity: 1.6 cubic ft.
 - 3. Power: 1200 watts.
 - 4. Features: Include Recessed glass turntable., INVERTER Precision Cook Technology
- F. Dishwasher: Undercounter.
 - 1. Bosch Model 500 Series- Stainless Steel SHX65DM5N
 - a. 5 Cycle selections with 6 wash options.
 - b. Bar Handle
 - c. Quiet, 44 dBA.
 - 2. Features: Include rinse aid dispenser, optional no-heat dry, optional water temperature boost, and rack adjustability.
 - 3. Finish: Stainless steel .
- G. Ice Maker: Undercounter.
 - 1. Scotsman CU515-70lb Cube Ice Machine. Self contained undercounter height with storage.
 - 2. Stores up to 24lbs.
- H. Coffee Maker:
 - 1. Bunn Axiom 15-3, 12 cup, three lower burners
 - 2. Capacity: 200 oz tank

2.02 LAUNDRY APPLIANCES

- A. Clothes Washer: Top-loading stationary.
 - 1. Size: Large capacity. 4.3 CU. ft.
 - 2. Controls: Solid state electronic.
 - 3. Cycles: Include 6 preset.
 - 4. Motor Speed: Variable speed, 1HP . 7 cycles
 - a. 4-Way Agitator, Turbo-Drum, 6-Motion Technology
 - 5. Features: Include stainless steel drum.
 - 6. Finish: Painted steel , color white.
 - 7. Manufacturers:
 - a. LG Ultra Large Capacity Top Load washer, WT7005c
- B. Clothes Dryer: Natural gas, stationary.
 - 1. Size; Large capacity 7.3 cu. ft.
 - 2. Aluminum alloy drum.
 - 3. Cycles: Include 9 preset.
 - 4. Temp selections: 4
 - 5. Finish: Painted steel , color white.
 - 6. Manufacture:
 - a. LG Ultra Large Capacity, model DWG7001W

2.03 ICE MACHINE-COMMERCIAL

- A. Scotsman Model CME 506WS -1D with HTB350 Modular Bin.
 - 1. 500 lb Cube Ice Machine

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

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

3.03 ADJUSTING

- A. Adjust equipment to provide efficient operation.

3.04 CLEANING

- A. Remove packing materials from equipment and properly discard.
- B. Wash and clean equipment.

END OF SECTION

**SECTION 11 3100
COMMERCIAL EQUIPMENT**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Decon Washer
- B. Commercial Dryer

1.02 RELATED REQUIREMENTS

- A. Section 26 0000 - Equipment Wiring: Electrical connections for equipment.

1.03 REFERENCE STANDARDS

- A. AGA - American Gas Association.
- B. NEMA - National Electrical Manufacturers Association.

1.04 SUBMITTALS

- A. See Section 01 3000 - "Submittals", for submittal procedures.
- B. Product Data: Provide manufacturer's data indicating dimensions, capacity and operating features of each piece of residential equipment specified.
- C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Electrical Appliances: Listed and labeled by UL and complying with NEMA Standards.

PART 2 PRODUCTS

2.01 COMMERCIAL DRYER

- A. MANUFACTURE: Circul-Air-Corp, www.circul-air-corp.com; Ph 877.795-1150.
- B. Model: CACTD-75-85, Turnout Gear Tumble Dryer. Meets NFPA 1851:2020.
- C. Size: Large capacity. 75 lbs-85lbs.

2.02 WASHER EXTRACTOR:

- A. MANUFACTURE: Circul-Air-Corp, www.circul-air-corp.com; Ph 877.795-1150.
- B. Model: CACSHD-70, HD series extractor, soft mount. Meets NFPA 1851:2020.
- C. Size: Large capacity. 70 lbs
- D. Programable-preset to multiple formulation to meet type of gear requirements.
- E. Features: Include sound insulation, end of cycle signal, and compliant 100 G Extraction.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify utility rough-ins are present and correctly located.

3.02 INSTALLATION

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

3.03 ADJUSTING

- A. Adjust operating equipment for efficient and for smooth operation.

END OF SECTION

**SECTION 11 6623
GYMNASIUM EQUIPMENT**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Gymnasium exercise machines and equipment.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete floor slab to receive floor sleeves and anchors.
- B. Section 09 6566 - Resilient Athletic Flooring: Gymnasium flooring.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
 - 1. Manufacturer's installation instructions.
- C. Operating and maintenance data for each operating equipment item.
- D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.
- B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.
- C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Gymnasium Equipment:
 - 1. Advanced Exercise
 - 2. Contact: Jarret Tooley; 310.409.3732; jtooley@advancedexercise.com
 - 3. Or approved equal.
 - 4. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 EXERCISE EQUIPMENT

- A. Exercise Machines, Equipment, Free weights, Racks, Accessories, etc.
 - 1. Contractor to purchase and install all exercise equipment and accessories shown in Appendix C.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.
- B. Verify that electrical services are correctly located and have proper characteristics.

3.02 INSTALLATION

- A. Install in accordance with Contract Documents and manufacturer's instructions.
- B. Install equipment rigid, straight, plumb, and level.
- C. Secure equipment with manufacturer's recommended anchoring devices.
- D. Separate dissimilar metals to prevent electrolytic corrosion.

3.03 ADJUSTING

- A. Verify proper placement of equipment.
- B. Verify proper placement of equipment anchors and sleeves, and use actual movable equipment to be anchored if available.
- C. Adjust operating equipment for proper operation; remove and replace equipment causing noise or vibration; lubricate equipment as recommended by manufacturer.

3.04 CLEANING

- A. Remove masking or protective covering from finished surfaces.
- B. Clean equipment in accordance with manufacturer's recommendations.

3.05 PROTECTION

- A. Protect installed products until Date of Substantial Completion.
- B. Replace damaged products before Date of Substantial Completion.

END OF SECTION

**SECTION 12 2400
WINDOW SHADES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior manual roller shades.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2015.
- C. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.
- D. WCMA A100.1 - Safety of Window Covering Products; 2018.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Where motorized shades are to be controlled by control systems provided under other sections, coordinate the work with other trades to provide compatible products.
- B. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.
- C. Sequencing:

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
- C. Shop Drawings: Include shade schedule indicating size, location and keys to details, mounting dimension requirements for each product and condition, and operation direction.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of this type with minimum 5 years of documented experience with shading systems of similar size and type.
 - 1. Manufacturer's authorized representative.
 - 2. Factory training and demonstrated experience.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
 - 1. Shade Hardware: One year.
 - 2. Fabric: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Interior Manually Operated Roller Shades:
 - 1. Draper, Inc; Clutch Operated FlexShade: www.draperinc.com

- a. Contact email: kgreenway@draperinc.com.
2. MechoShade Systems LLC; Mecho/5 System: www.mechoshade.com/#sle.
3. TimberBlindMetroShade; SolarVue Manual Roller Shade:
www.timberblinds.com/commercial-division/#sle.
4. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 MANUALLY OPERATED WINDOW SHADES

- A. Heavy-Duty Manually Operated Window Shades with Independent Control: Manually operated, vertical roll-up, fabric window shade with components necessary for complete installation. Basis of Design: Clutch-Operated FlexShade NEXD as manufactured by Draper, Inc.
 1. Operation: Bead chain and clutch operating mechanism allowing shade to stop when chain is released. Designed never to need adjustment or lubrication. Provide limit stops to prevent shade from being raised or lowered too far.
 - a. Clutch mechanism: Fabricated from POM thermoplastic with welded 0.354 inch (9 mm) primary steel post with rotational bearing, overrunning design, and positive mechanical engagement of drive mechanism to tube. White or Black color as selected by Architect. Center bead chain placement for right or left hand operation and accommodates side channel with no adjustment of chain location.
 - b. Bead chain loop: Stainless steel bead chain.
 - c. Bead Chain Hold Down: P-Clip.
 2. Dual Roller Configuration / Mounting:
 - a. Dual roller fascia. Endcaps with fascia designed for surface mounting of dual roller window shades.
 - 1) Endcaps: 1028 steel stamping.
 - 2) Fascia: L-shaped cover of extruded aluminum, .060 wall. Assembly snaps onto endcaps without exposed fasteners.
 - 3) Size: 4-3/4 inches deep x 7 inches high x length required by window opening.
 - 4) Finish: Clear anodized.
 - b. Shade slat:
 - 1) Closed pocket elliptical slat: 1 inch (25 mm) aluminum elliptical slat inside of a 1-5/8 inch (41 mm) pocket with heat sealed ends.
 - c. Aluminum Light Gap Reduction Channels
 - 1) U Channel - 1 inch by 2-1/2 inches (25 mm by 64 mm).with light filtering strip
 - 2) Side and sill U channel installation
 - 3) Shades to be outside mount
 3. Rollers: Extruded aluminum roller tube of appropriate diameter to support shade fabric with minimal deflection.
 - a. Minimum Roller Tube Diameter: 1.50 inches.
 - b. Fabric Connection to Roller Tube: Spline fabric/roller attachment system to allow shade fabric to be removed from roller without having to remove roller from brackets.
 - c. Fabric Length: 6 inches (152 mm) greater than window height minimum.

2.03 SHADE FABRIC

- A. Light Filtering Fabrics:
 1. SheerWeave Series SW2400 by Phifer: VOC Emissions: GREENGUARD Gold - certified as a low emitting fabric. Manufacturer to supply GREENGUARD Gold. 500 denier fiberglass, vinyl coated and woven into a 2 x 2 basket weave. Fire rating: NFPA 701. Bacteria and Fungal Resistance: ASTM G 21 and ASTM G 22. Series SW2400, 3 percent open, .019 inches thick.
- B. Room Darkening Fabrics
 1. SheerWeave Series SW7500 by Phifer: PVC-free polyester with an acrylic coating. Fire rating: California U.S. Title 19 (small scale), NFPA 101 (Class A Rating), NFPA 701 TM#1 (small scale), BS 5867 Part 2 Type B Performance, CAN/ULC-S 109 (large and small

scale), IBC Section 803.1.1 (Class A Rating), CAN/CGSB 2-4.162-M80. Bacterial and fungal resistance: ASTM E 2180 and ASTM G21. GREENGUARD Gold

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. Start of installation shall be considered acceptance of substrates.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.
- B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.03 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.
- C. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.

3.04 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.
- B. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.
- C. Training: Train Owner's personnel on operation and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours training by manufacturer's authorized personnel at location designated by the Owner.

3.05 PROTECTION

- A. Protect installed products from subsequent construction operations.
- B. Touch-up, repair, or replace damaged products before Substantial Completion.

3.06 SCHEDULES

- A. Manually Operated Shades:
 - 1. Shade Type SM, Single Roller
 - a. Mounting Type: Wall Mounted.
 - b. Location: Office - Type G window.
 - 2. Shade Type DM, Dual Roller
 - a. Mounting Type: Wall mounted
 - b. Location: Sleep Quarters - Type E/E1 windows.

END OF SECTION

SECTION 12 3600 COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Countertops for architectural cabinet work.

1.02 RELATED REQUIREMENTS

- A. Section 06 4100 - Architectural Wood Casework.
- B. Section 22 4000 - Plumbing Fixtures: Sinks.

1.03 REFERENCE STANDARDS

- A. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.
- B. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.
- C. AWI (QCP) - Quality Certification Program; Current Edition.
- D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
- E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).
- F. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- G. MIA (DSDM) - Dimensional Stone Design Manual, Version VIII; 2016.
- H. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- I. PS 1 - Structural Plywood; 2009.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
- F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- G. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Same fabricator as for cabinets on which tops are to be installed.
- B. Quality Certification:
 - 1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.

2. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
3. Provide designated labels on shop drawings as required by certification program.
4. Provide designated labels on installed products as required by certification program.
5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

C. Fabricator and Installer Qualifications: Minimum 3 years experience in work of this Section.

1.06 WARRANTY

- A. Provide manufacturer's 10 year warranty against defects in material and workmanship.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 PRODUCTS

2.01 COUNTERTOPS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
1. Flat Sheet Thickness: 1/2 inch, minimum.
 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Dupont: www.corian.com/#sle.
 - 2) Formica Corporation: www.formica.com/#sle.
 - 3) LG Hausys America, Inc; HI-MACS 12mm: www.lghausysusa.com/#sle.
 - 4) Meganite, Inc: www.meganite.com/#sle.
 - 5) Wilsonart: www.wilsonart.com/#sle.
 - 6) Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
 - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - c. Color and Pattern: As selected by Architect from manufacturer's full line.
 3. Other Components Thickness: 1/2 inch, minimum.
 4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; edge profile as indicated on drawings.
 5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
 6. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

2.02 MATERIALS

- A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.
- B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- C. Joint Sealant: Mildew-resistant silicone sealant, white.

2.03 FABRICATION

- A. Cut quartz panels accurately to required shapes and dimensions.

- B. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.
 - 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
 - 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- C. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 - 2. Height: 4 inches, unless otherwise indicated.
- D. Stainless Steel: Fabricate tops up to 144 inches long in one piece including nosings and back and end splashes; accurately fitted mechanical field joints in lengths over that dimension are permitted.
 - 1. Weld joints; grind smooth and polish to match.
 - 2. Provide stainless steel hat channel stiffeners, welded or soldered to underside, where indicated on drawings.
 - 3. Provide wall clips for support of back/end splash turndowns.
 - 4. Sound Deadening: Apply water resistant, fire resistant sound deadening mastic to entire bottom surface.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 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 the project conditions.

3.03 INSTALLATION

- A. Install fabrications in accordance with manufacturer's instructions and approved Shop Drawings.
- B. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- C. Attach stainless steel countertops using stainless steel fasteners and clips.
- D. Seal joint between back/end splashes and vertical surfaces.

3.04 CLEANING

- A. Clean countertops surfaces in accordance with manufacturer's instructions..

3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

**SECTION 12 5800
RESIDENTIAL FURNITURE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Reclining Chairs.
- B. Dining Table and Chairs
- C. Office Desks and files
- D. Mattresses
- E. Outdoor Dining Table and Chairs

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- B. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver to project site in wrapped in protective materials..
- B. Store under cover and elevated above grade.

1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer Warranty: Provide 1 year min. manufacturer warranty for defective finishes or moving parts. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MATTRESSES

- A. Basis of Design Manufacturer: Beautyrest.
- B. Seller: . MattressFIRM; www.mattressfirm.com; PH 877.384.2903.
 - 1. Description: Beautyrest BR800 11.5 Firm
 - 2. Composition: Dual Cool Technology.
 - a. Quilting Layer: Comfort Foam, SMAT AirCool-Foam
 - b. Comfort Layer; GelTouch Foam
 - c. Support System: Pocketed Coil Technology
 - 3. Size: 11.5 inch., Twin XL
 - 4. Warranty: 10 years covering manufacturing defects.
 - 5. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 RECLINER

- A. Basis of Design Manufacturer: Fire Station Furniture.
 - 1. Seller: Firestation Furniture, www.firestationfurnitures.com, 855-997-0575.
 - 2. Model: Duty-Built Recliner Station PRO Recilner, designed for tall users.
- B. Description: Upholstered Reclining Seating
 - 1. Size: 37.5W x 39.5D x 44.5H.
 - 2. Heavy duty hardwood frame with steel truss plate reinforced joints.
 - 3. Upolstery: Medical Grade Vinyl. 85%PVS, 13% Cotton, 2% High Tech Compound.
 - 4. Surface impermeable to moisture, fuild resistant.

5. Easy to clean.
6. Color: To be selected by Architect from full range.
7. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.03 DINING TABLE

- A. Description: Mt. Bobbell Rectangular Conference Table Base and Top; Manuf. FormaSpace Contract Furniture. Website www.formaspacecontract.com; Ph 866.488.0152.
 1. Base: Metal Frame Base Option-A, with base levelers.
 - a. Paint color: Ral xxxx
 - b. Quantity as required
 2. Top: Rectangular Conference Table, Laminate top, Size 48" x 120"
 - a. Standard Laminate
 - b. Laminate color:xxxxxx
 3. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.04 CHAIRS

- A. Seller: GM Business Interiors, PH 800.686.6583; 1099 W. La Cadena Drive, Riverside, CA.
- B. Dinning Chairs
 1. Herman Miller Caper Multipurpose Chair.
 2. Seat Style: Flexnet
 3. No arms.
 4. Color: Graphite
 5. Back color:
 6. Frame color: Black
 7. Caster: Hard Floor or carpet Casters
 8. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- C. Sleep Quarters Task Chairs
 1. Herman Miller Casper Stacking Chair.
 2. Color: Graphite
 3. Frame: Metallic Silver
 4. Caster: Hard Floor or arpet Casters
 5. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.05 PATIO DINING TABLE AND CHAIRS

- A. Manufacturer: Hanover
- B. Description: Cast Aluminum table and Aluminum / sling fabric chairs
 1. Style: Fontana 7 piece.
 2. Size: Table 84L x 42W .
 3. Construction: Ca Aluminum
 4. Chairs: Sling PVC Fabric , Weight Cap. 250 lbs
 5. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify that furniture is clean and not damaged..

3.02 ADJUSTING

- A. Level tables.

SECTION 13 3420

METAL BUILDING SYSTEMS (CARPORT)

PART 1 – GENERAL

1.01 WORK INCLUDED

Pre-engineered, shop-fabricated metal carport structure, complete with structural framing (columns/footings, rafters, struts, purlins, girts, diagonal bracing) pre-finished roofing, metal flashings, trim, gutters & downspouts, diagonal bracing; fasteners and bolts, accessories, and other components and material required for complete installation.

1.02 DESCRIPTION

Building Type: Clear span single-slope rigid frame with uniform depth column and straight rafter sections of shop welded steel plates. Building size as shown on drawings. Eave measured vertically from top of eave strut at sidewall steel line to base of sidewall frame column; the minimum vertical clearance from finished floor to underneath the rigid frame rafter at 9'-0" clear with a 0.5 Roof Slope.

Column Spacing: As shown on drawings and compatible with placement of openings and other requirements.

1.03 QUALITY ASSURANCE

Codes and Standards Required:

- 1) AWS D1.1/D4.1M:2006 "Structural Welding Code-Steel"
- 2) MBMA "Low Rise Building Systems Manual," (2006 Edition)
- 3) AISI "Specifications for the Design of Cold Formed Steel Structural Members" (2001 specifications with 2004 supplement)
- 4) AISC "Steel Construction Manual" and "Specifications Structural Steel Buildings" (AISC 360-05, Thirteenth Edition)
- 5) AISC "Specifications for Structural Joints Using ASTM A325 or ASTM A490 bolts"
- 6) AISC "Seismic Provisions for Structural Steel Buildings" (AISC 341-05)
- 7) IBC "International Building Code," 2018 Edition, and 2019 CBC "California Building Code"
- 8) Current member with approvals from IAS, MBMA, ICBO and AISC
- 9) Use the following where applicable in other phases of design:
 - Building Code and regulations of other governing authorities having jurisdiction at project site
 - American Society for Testing and Materials (ASTM), Standards as referenced above

Design Loads:

- 1) *Basic Design Loads:* To include Roof Live Load of 20 PSF, Collateral Load of 1, Minimum Roof Snow Load of 100, Ground Snow Load of 75, Wind Load of 3 second speed 120 mph, Exposure C and Seismic Load of $S_s = 2.836$, $S_1 = .989$, Soil Class=D in addition to dead loads. Consider all other design loads, whether they are of static or dynamic nature, as auxiliary loads, or as per drawings show/indicate. Design to include additional 5 PSF minimum roof dead load for future Photovoltaic System across entire roof surface.
- 2) *Wind Loads:* Design structure for 120 MPH. Exposure proportioned and applied horizontal and uplift forces according to "Low-Rise Building Systems Manual" design practices or the latest edition of the IBC-2021, and the local building code (such as CBC 2022).
- 3) *Deflection standards shall be* **H/60** for Rigid Frame under 10-Year Wind Load and Elastic Seismic Load.
- 4) *Load Combinations:* The loads listed herein shall be considered to act in the following combinations, whichever produces the most unfavorable effects on the building or structural member concerned:

IBC 2021 & CBC 2022, Section 1605.3.1. Basic load combinations:

- $D + C$
- $D + C + (L_r \text{ or } S)$
- $0.6D + W$
- $D + W$
- $D + C + 0.7E$
- $D + C + 0.75 (W + (L_r \text{ or } S))$
- $D + C + 0.75 (0.7E + (L_r \text{ or } S))$
- $0.6 (D + C) + 0.7E$

Where,

- D = Dead Load
- L_r = Roof Live Load
- W = Wind Load
- E = Seismic Load
- C = Collateral Load
- S = Roof Snow Load

Building System Reference Standard:

To establish quality by which metal building systems by any other manufacturers will be judged, bidders are advised that this specification is based upon metal building systems produced by CBC Steel Buildings in Lathrop, CA. All materials as stated. **Made in the U.S.A. with mill certifications are required.** (Or approved equal).

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Drawings and Calculations:
 - a) Design Calculations and Erection Drawings: Prepared by, or under direct supervision of, Registered Professional Engineer, licensed to practice in the State of California with all drawings and calculations bearing his/her seal.
 - b) Show each type structural building frame required and their locations within structure; details of anchor bolts settings; sidewall, end wall and roof framing; diagonal bracing and location within structure; longitudinal and transverse cross sections; trim, gutters, downspouts, wall and roof coverings, and all accessory items; materials; construction details; and other pertinent information required for proper and complete fabrication, for proper assembly and erection of a watertight metal building system by a qualified erector.
- C. Material and Color Samples:
 - a) Submit duplicate color sample sets showing full color range available.
- D. Product Data: Two (2) copies of Manufacturer's Specifications and Descriptive Literature

1.05 PRODUCT HANDLING, DELIVERY AND STORAGE

- A. Delivery and store prefabricated components, sheets, panels and other manufactured items so they will not be damaged or deformed.
- B. Stack materials on platforms or pallets above grade or on concrete slab, covered with opaque tarpaulins or other approved weather-resistant ventilated covering.
- C. Store metal sheets and panels in such manner so they will drain freely if subjected to water accumulation. Do not store sheets and panels in contact with other materials, which might cause staining.
- D. Damaged material must be reported to determine if replacement is required.
- E. Inspect panels to prevent moisture between panels and secure as required.
- F. Delivery to job site within Five (5) weeks of Release order with signed off redlined drawings.

1.06 WARRANTIES

- A. All Components: Manufacturer's standard one (1) year workmanship warranty.
- B. Roof Panels: Manufacturer's standard twenty-five (25) year paint color-finish Warranty and manufacturer's standard twenty (20) year Zincolume no Perforation warranty.

PART 2 - PRODUCTS AND FABRICATION

2.00 MANUFACTURER

A. Metal Buildings:

1. CBC Steel Buildings, a Nucor Company: www.cbcsteelbuildings.com
2. Or approved equal.
3. Substitutions: See Section 01 6000 - Product Requirements

2.01 STRUCTURAL STEEL

A. Materials:

1. Structural Plate or Bar Stock: Minimum yield strength (Fy) of 55,000.
2. Cold Formed Structural Steel: Minimum yield strength (Fy) of 55,000.
3. Primary Framing Structural Bolts and Nuts: ASTM A325; size and quantity required by metal building system manufacturer.
4. Prime Coat Paint: Manufacturer's standard equal to Fed. Spec. TT-P-636D.

B. Fabrication:

1. Primary Framing: Rigid Frames of shop-welded steel plate columns and rafters, as per drawings and uniform depth sections as required by drawings. Complete with all necessary stiffeners, connection plates, and holes for field bolted assembly.
 - a) Columns end Rafters: Fabricated with holes in web and/or flanges for attachment of secondary members.
 - b) Splice Plates: Factory fabricate for precision for all rafter-to-rafter and/or column-to rafter connections, complete with connection boltholes.
 - c) Base Plates, Cap Plates, Splice Plates, and Stiffeners: Fabricate to sizes required. Complete with all holes for connection of primary and secondary structural members. Factory weld into place.
 - d) Join flanges and webs of structural members fabricated of plate or bar stock together by continuous submerged automatic arc welding process with all welding performed under the supervision of certified welders in accordance with standard practices of AWS D1.1.
 - e) All shop welding is to be continuously inspected by a designated qualified inspection agency unless the fabricator is approved by the International Conference of Building Officials Evaluation Service, (ICBO-ES).
 - f) Make all primary rigid frame field-bolted connections with A325 high-strength bolts of size required by building system manufacturer.
 - g) Clean all components of oil, dirt, loose scale and foreign matters. Factory paint with Manufacturer's standard primer coat(s).

2. Secondary Framing, (Purlins, Girts, Struts, Flange Bracing, Base Angles, as required).
 - a) Purlins: Manufacturer's standard 8" & 9½" Z sections roll formed from minimum yield (Fy) 55,000 steel, punched for attachment.
 - b) Girts: 8" & 9½" Z or channel sections of roll formed minimum yield (Fy) 55,000 steel, punched for attachment with ½" diameter bolts.
 - c) Eave Struts: 8" & 9½" deep sections of cold-formed minimum yield (Fy) 55,000 steel, with vertical web to receive sidewall panels and two (2) ½" diameter bolt attachments to rigid frame in factory-punched holes in column or bracket.
 - d) Flange Braces: Steel angles attached to purlin or girt, to support rigid frame flanges as required. Indicated by design and noted on final shop drawings.
 - e) Clean secondary framing components to be free from oil, dirt, loose scale, and foreign matter and coated with a G-90 galvanized covering.
3. Wind bracing: approved-type extra high-strength cable, A36 steel rod bracing, and/or portal frames as shown on final shop drawings.

2.02 ROOFING

- 1) Roofing:
 - a) Roof Panels: To match Fire Station's metal roofing system, Section 07 4113 – Metal Roof panels.
- 2) Panel finishes:
 - a) Roof panels: To match Fire Station's metal roofing system, Section 07 4113 – Metal Roof panels / to be selected from manufacturer's standard colors by Owner
 - b) Roof perimeter trim: gutter and rake fascia shall be 22 ga. in manufacturer's standard colors as selected by Owner.
- 3) Fasteners for Roof to secondary framing shall be #12 x 1-1/4" Self-drilling carbon steel, zinc plated with color heads to match panel colors. Roof and Wall fasteners used for laps and trim shall be #14 x 7/8" self-drilling carbon steel, zinc plated stitch/lap screws.
- 4) Closures: Closures shall be of a closed-cell foam material of a gray or neutral color and shall be die cut to provide weather- tightness. Closures shall be placed at eave of roof sheets and perimeter base of all wall panels.

2.03 ACCESSORIES

- 1) Gutters, downspouts and flashing (as shown on drawings)
 - a) Gutters shall be suspended box sections of 24 ga. Galvanized steel, formed to match the configuration of the gable trim with the same color finish options as walls. Gutters shall be independent of the roof seat and be attached to the roof panel by

means of gutter hangers. Gutter hangers shall be spaced 3'-0" centers maximum and attached to inside leg of gutter by #12 stitch screws and to outer face of gutter by trim fasteners. Gutter sections shall be lapped a minimum of 2" sealed with sealant then fastened with trim fasteners. Gutter and closures shall be sealed with sealant and fastened with pop rivets.

- b) Downspouts shall be 24 ga. galvanized factory-colored steel with a minimum cross section of 12 square inches. Downspouts shall be located according to requirements as specified. An elbow shall be provided at the base of all downspouts to direct the water flow away from the building. Finish: manufacturer's standard color.

Accessories to be 24 ga. galvanized steel with color options for items c1.-c5.

- c1. Gutters
- c2. Downspouts
- c3. Flashing
- c4. Trim
- c5. Ridge covers

END OF SECTION

SECTION 21 13 00
FIRE SUPPRESSION SPRINKLER SYSTEMS

PART 1 - GENERAL

1.01 REFERENCES

- A. AMERICAN IRON AND STEEL INSTITUTE (AISI)
 - 1. AISC/AISI 121 (2007) Standard Definitions for Use in the Design of Steel Structures
- B. AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
 - 1. ASME A112.18.1 (2018) Plumbing Supply Fittings
 - 2. ASME B1.20.1 (2013) Pipe Threads, General Purpose (Inch)
 - 3. ASME/ANSI B16.1 (2020) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
 - 4. ASME/ANSI B16.3 (2016) Malleable Iron Threaded Fittings, Classes 150 and 300
 - 5. ASME/ANSI B16.4 (2016) Standard for Gray Iron Threaded Fittings; Classes 125 and 250
- C. AMERICAN WATER WORKS ASSOCIATION (AWWA)
 - 1. AWWA C111/A21.11 (2017) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 - 2. AWWA C151/A21.51 (2017) Ductile-Iron Pipe, Centrifugally Cast
 - 3. AWWA C900 (2016) Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4-inch Through 60-inch
- D. ASTM INTERNATIONAL (ASTM)
 - 1. ASTM A47/A47M (1999) Standard Specification for Ferritic Malleable Iron Castings
 - 2. ASTM A53/A53M (2020) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - 3. ASTM A135/A135M (2009; R2014) Standard Specification for Electric-Resistance-Welded Steel Pipe
 - 4. ASTM A234/A234M (2019) Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
 - 5. ASTM A536 (1984) Standard Specification for Ductile Iron Castings
 - 6. ASTM D1784 (2020) Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
- E. FM GLOBAL (FM)
 - 1. FM APP GUIDE (updated on-line) Approval Guide <http://www.approvalguide.com/>
- F. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
 - 1. NFPA 13 (2022) Standard for the Installation of Sprinkler Systems
 - 2. NFPA 24 (2019) Standard for the Installation of Private Fire Service Mains and Their Appurtenances
- G. UNDERWRITERS LABORATORIES (UL)

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Conduct a survey of the work area. Commencement of work constitutes acceptance of existing conditions.
- B. Convene one week before starting work of this section for preinstallation meeting.

1.03 SUBMITTALS

- A. Submit the following in accordance with DIVISION 01 – GENERAL REQUIREMENTS.
 - 1. Shop Drawings

- a. Shop drawings prepared in accordance with NFPA 13, including hydraulic calculations that are approved by the Authority Having Jurisdiction. Drawings shall have the approval of a Professional Engineer registered in the state in which the project is located. Drawings to consist of the following, refer to NFPA 13 "Plans and Calculations" for a comprehensive list of items to be included:
 - 1) Piping plan view and/or Reflected Ceiling Plan (RCP) drawing(s) indicating relationship of all other trades and approved sprinkler head locations.
 - 2) Details and sections to clearly identify design intent.
 - 3) Plans shall include: Seismic zones of influence, hydraulic remote areas, elevations of pipe, attachment locations and type, zones and associated coverage areas, volume of dry system(s) (if applicable), locations of seismic separation and expansion joints, hose cabinet locations, drain locations, primary fire pumps, secondary pumps, supply, pressure maintenance pumps, controllers, drivers and accessories.
2. Product Data
 - a. Provide data on piping, valves, sprinklers, hangers/supports, hose cabinets, notification devices, specialties and accessories. Product data shall include manufacturers catalog information with performance ratings, rough-in details, finish, weights, and installation requirements.
 - 1) Each product shall be referred to on submittals, drawings, and other documentation, by the identification or model number as specifically published in the appropriate agency listing or approval.
3. Design Data
 - a. Provide detailed hydraulic calculations that clearly demonstrate that the water supply will meet the demand of the sprinkler system and hose streams. Calculations shall accompany design drawings and shall be based on a water flow test conducted at the site within six (6) months of the submittal of plans for approval. Flow test information and associated nodes shall be documented on shop drawings and include a site plan.
 - b. Provide complete seismic calculations that clearly reflect seismic restraint with supporting site specific force factor and attachment details used, relative to an associated zone of influence.
4. Test Reports
 - a. Contractor's Material & Test Certificate Reports in accordance with NFPA for above ground piping, underground piping, pressure, system operation, air, valve and drain tests.

1.04 QUALITY ASSURANCE

- A. Fire protection system materials and components shall be Underwriter's Laboratories listed and labeled, or Factory Mutual approved.
- B. Company specializing in performing the work of this section shall have a minimum of five years experience and approved by manufacturer.
- C. Manufacturing Company shall be one specializing in manufacturing the products specified with a minimum three years documented experience.

1.05 COORDINATION

- A. The Contractor shall coordinate and reflect routing and location of equipment, devices, and materials with other disciplines, where not already indicated, on the design documents. Indicate required space for routine maintenance and inspection, including location and sizes of access doors.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

- A. All fire protection system materials and equipment shall be Underwriters Laboratories (UL) listed or the Factory Mutual (FM) approved for its intended use.

2.02 EQUIPMENT

- A. Aboveground Piping Materials
 - 1. BCS - Black Carbon Steel
 - a. All piping 2-inch and smaller: Schedule 40, black-carbon steel conforming to ASTM A53, or ASTM A135, threaded or roll grooved ends. All 1-inch pipe shall have threaded ends.
 - b. All Piping 2-1/2-inch through 8 inch: Schedule 10, black carbon steel conforming to ASTM A53 or ASTM A135, roll grooved ends.
- B. Fittings and Couplings
 - 1. Cast-Iron Threaded Fittings:
 - a. ASME/ANSI B16.4, Class 125, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.
 - 2. Malleable-Iron Threaded Fittings:
 - a. ASME/ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B1.2.1.
 - 3. Steel Fittings:
 - a. ASTM A234/A234M, seamless or welded, for welded joints.
 - 4. Grooved Mechanical Fittings:
 - a. ASTM A536, Grade 65-45-12 ductile iron; ASTM A47 Grade 32510 malleable iron; or ASTM A53, Type F or Types E or S, Grade B fabricated steel fittings with grooves or shoulders designed to accept grooved end couplings.
 - 5. Grooved Mechanical Couplings:
 - a. consist of ductile or malleable iron housing, a synthetic rubber gasket of a central cavity pressure-responsive design; with nuts, bolts, locking in, locking toggle, or lugs to secure roll-grooved pipe and fittings. Grooved mechanical couplings including gaskets used on dry-pipe systems shall be listed for dry-pipe service.
 - 6. Cast-Iron Flanges:
 - a. ASME/ANSI B16.1, Class 125, raised ground face, bolt holes spot faced.
 - 7. Unions:
 - a. Malleable iron, Class 150 hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces, female threaded ends. Threads shall conform to ASME B1.20.1.
 - 8. Dielectric Unions:
 - a. Threaded, solder, or grooved-end connections as required to suit application' constructed to isolate dissimilar metals, prevent galvanic action, and prevent corrosion.
- C. Pipe Hangers and Supports
 - 1. Shall be UL listed and shall meet requirements of NFPA 13 for type, dimension and location.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.
 - 4. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
 - 5. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
 - 6. Vertical Support: Steel riser clamp.

7. Hanger Rods: Use only circular solid cross section rod hangers to connect building structure attachments to pipe-support devices. Use pipe, straps, or bars of equivalent strength for hangers.
- D. Alarm Devices
1. General: Types and sizes shall mate and match piping and equipment connections.
 2. Water Flow Indicators (Wet-pipe Systems): vane type waterflow detector, rated to 250 psi; designed for horizontal or vertical installation; have 2-SPDT circuit switches to provide isolated alarm and auxiliary contacts, 7 ampere 125 volts AC and 0.25 ampere 24 Volts DC; completed with factory-set, field-adjustable retard element to prevent false signals, and tamperproof cover.
 3. Electric Alarm Bell: UL listed 10" electric operated factory painted alarm bell with weatherproof bell kit and bell guard. Bell shall have minimum 90 decibel rating. Provided engraved plate under Bell lettered "Building Standpipe and Sprinkler System."
 4. Supervisory Switches: SPST, normally closed contacts, designed to signal valve in other than full open position and tamperproof cover.

2.03 AUTOMATIC SPRINKLERS

- A. Sprinklers must comply with UL 199 and NFPA 13. Sprinklers with internal O-rings are not acceptable. Sprinklers in high heat areas including attic spaces or in close proximity to unit heaters must have temperature classification in accordance with NFPA 13. Extended coverage sprinklers are permitted for loading docks, residential occupancies and high-piled storage applications only.
1. Sprinkler Finishes: Provide sprinklers and matching escutcheons as indicated in the contract documents or as approved by Owner or Architect. All sprinklers are to be glass bulb type unless otherwise approved by Owner or Architect.
 2. Upright Sprinkler
 - a. Upright sprinkler must be quick-response type and have a nominal K-factor of 5.6.
 3. Pendent Sprinkler
 - a. Pendent sprinkler must be quick-response type and have a nominal K-factor of 5.6.
 4. Concealed Sprinkler
 - a. Concealed sprinkler must be quick-response type and have a nominal K-factor of 5.6. Cover plate must match ceiling.
- B. Sprinkler Cabinet and Wrench: Provide spare sprinklers in accordance with NFPA 13 and must be placed in a suitable metal or plastic cabinet of sufficient size to accommodate all the spare sprinklers and wrenches in designated locations. Spare sprinklers must be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed as required by NFPA 13. At least one wrench of each type required must be provided.
- C. Head Protection
1. Protect heads with paper or plastic bags during painting operations. Remove protection immediately upon finishing painting operations.
 2. Provide head guards wherever mechanical damage could occur. Guard finish to be red enamel.
- D. Aboveground Valves
1. Ensure gate, globe, and check valves (all sizes) are FM approved or UL listed.
 2. Ensure ball valves, 2 inches and under, are FM approved, rated 300 psi, with provisions to wire or lock handle in place where critical alarm function may be isolated.
 3. Ensure butterfly valves, 6-inches and larger are FM approved, rated 175 psi, cast-iron bodied wafer type, with elastomer liners and seals.
- E. Paints and Coatings
1. Paints and coatings must comply with:

- a. The California Department of Public Health (CDPH) Standard Method v1.1-2010 general testing and emissions evaluation requirements.
 - b. All paints/coatings wet-applied on site must meet the applicable VOC limits of the California Air Resources Board (2007), Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.
- F. Adhesives, Sealants, and Sealant Primers
- 1. Adhesives, sealants, and sealant primers must comply with:
 - a. The California Department of Public Health (CDPH) Standard Method v1.1-2010 general testing and emissions evaluation requirements.
 - b. All adhesives, sealants, and sealant primers wet-applied on site must meet the applicable chemical content requirements of SCAQMD Rule 1168, July 1, 2005, Adhesive and Sealant Applications, as analyzed by methods specified in Rule 1168.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Painting
 - 1. If manufacturer's standard-finish equipment surfaces are damaged during construction, bring to as-new condition by touchup or repainting to the satisfaction of the Contracting Officer, or replaced with new undamaged equipment at no additional cost to the Owner.

3.02 INSTALLATION

- A. Ensure installation of system materials and equipment is in accordance with the recommendations and provisions of NFPA 13 and NFPA 24. Perform work in the presence of the Contracting Officer.
- B. Perform all installation work by licensed fire protection sprinkler contractors, licensed for such work in the state where the work is to be performed.

3.03 UNDERGROUND PIPING INSTALLATION

- A. The fire protection water main shall be laid, and joints anchored, in accordance with NFPA 24. Minimum depth of cover shall be 3-feet. The supply line shall terminate inside the building with a flanged piece, the bottom of which shall be set not less than 6-inches above the finished floor. A blind flange shall be installed temporarily on top of the flanged piece to prevent the entrance of foreign matter into the supply line.
- B. Thrust Blocks
 - 1. Construct 3,000-psi cured-strength thrust blocks to absorb hydraulic thrust at caps, plugs, and at system change-of-direction fittings. Place concrete against undisturbed soil, with an area sufficient to provide load transmittal.

3.04 ABOVEGROUND PIPING INSTALLATION

- A. Locations and Arrangements: Coordinate installation of horizontal piping with other components. Allow sufficient space above removable ceiling panels to allow for panel removal.
- B. Install system such that all piping is rigidly secured and supported. Cutting of structural members for passage of sprinkler pipes or hangers will not be permitted. Route all sprinkler piping and provide all offsets, bends and elbows around all mechanical, electrical, and structural members as required. In areas with ceilings, piping shall be routed concealed, above ceiling. In areas without ceilings, piping shall extend as high as possible.
- C. Deviations from approved "Working Plans" for sprinkler piping require written approval of the Authority Having Jurisdiction. Written approval shall be on file with the Engineer prior to deviating from the approved "Working Plans."
- D. Install sprinkler piping to provide for system drainage in accordance with NFPA 13.

- E. Use approved fittings to make all changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- F. Hangers and Supports: Comply with the requirements of NFPA 13. Hanger support spacing and locations for piping joined with grooved mechanical couples shall be in accordance with the grooved mechanical coupling manufacturer's written instructions, for rigid systems. Provide protection from damage where subject to earthquake if required by the applicable building code, designed in accordance with NFPA 13.
- G. Make connections between underground and aboveground piping using an approved transition piece strapped or fastened to prevent separation.
- H. Install mechanical sleeve seal at pipe penetrations in basement and foundation walls.
- I. Install test connections sized and located in accordance with NFPA 13 complete with shutoff valve. Test connections may also serve as drain pipes.
- J. Install pressure gauge on the riser or feed main at or near each test connection. Provide gauge with a connection not less than 1/4 inch and having a soft metal seated globe valve arranged for draining pipe between gauge and valve. Install gauges to permit removal, and where they will not be subject to freezing.
- K. Install automatic air vent at high point of system(s) in accordance with NFPA 13.
- L. Sleeves
 - 1. Provide sleeves where piping passes through roofs, masonry or concrete walls, or floors.
 - 2. Continuously weld or braze sleeves to the deck when passing through steel decks.
 - 3. Install sleeves that are continuous when extending through floors, roofs, or load-bearing walls, and sleeves through fire barriers. Fabricate sleeves from Schedule 40 steel pipe with welded anchor lugs. Form other sleeves by molded linear polyethylene liners or similar materials that are removable. Ensure diameter of sleeves is large enough to accommodate pipe, insulation, and jacketing without touching the sleeve, and additionally provides a minimum 3/8-inch clearance. Install sleeve to accommodate mechanical and thermal motion of pipe and to preclude transmission of vibration to walls and generation of noise.
 - 4. Pack solid the space between a pipe and the inside of a pipe sleeve or a construction surface penetration or wherever the piping passes through firewalls, equipment-room walls, floors, and ceilings connected to occupied spaces, and other locations where sleeves or construction-surface penetrations occur between occupied spaces. Use a mineral fiber. Where sleeves or construction-surface penetrations occur between conditioned and unconditioned spaces, fill the space between a pipe, bare or insulated, and the inside of a pipe sleeve or construction-surface penetration with an elastomer caulk to a depth of 1/2 inch. Ensure surfaces are oil- and grease-free before caulking.
 - 5. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- M. Escutcheons
 - 1. Install escutcheons at penetrations of piping into finished areas. Where finished areas are separated by partitions through which piping passes, provide escutcheons on both sides of the partition. Where suspended ceilings are installed, attach plates at the underside only of such ceilings. Use chrome plated escutcheons in occupied spaces and conceal openings in building construction. Ensure escutcheons are firmly attached.

3.05 FIELD QUALITY CONTROL

- A. System Testing
 - 1. Prior to acceptance of the work, test completed systems in the presence of the Contracting Officer. Upon approval, provide certificates of testing.
 - 2. Conduct a hydrostatic test, unless otherwise specified. Use only potable water for testing.
 - 3. Perform air tests, valve-operating tests, and drainage tests for dry-pipe systems.
 - 4. Perform full-flow system operating tests for standpipe systems.

5. Prepare and maintain test records of piping-system tests. Ensure records show personnel responsibilities, dates, test-gage identification numbers, ambient and test-water temperatures, pressure ranges, rates of pressure drops, and leakage rates. Each test acceptance requires the signature of the Contracting Officer.
- B. Test Gauges
 1. Acceptable test gages have 4-1/2-inch dials or larger with accuracy of plus or minus 1/2 of 1 percent of full-scale range and dial graduations and pointer width compatible with readability to within one-half of the accuracy extremes.
- C. Pneumatic Testing
 1. Perform pneumatic Pressure Tests when freezing conditions may occur and upon prior approval by the Contracting Officer. Use oil-free compressed air used for testing.
- D. Test and Acceptable Criteria
 1. Perform above ground systems pressure tests at 200 psi and maintain the applied pressure without further addition of test media for not less than 2 hours. No pressure drop is allowed.
 2. Test underground rubber-jointed ferrous-pipe water systems at 200 psi, and maintain the applied test pressure for not less than 2 hours. Maximum allowable pressure drop is 2 psi. After satisfactory hydrostatic testing, test piping for leakage as follows:
 - a. Duration of each leakage test is not less than 2 hours; during the test, subject the main to 200 psi pressure based on the elevation of the lowest section under test and corrected to the elevation of the test gage.
 - b. Leakage is defined as the quantity of water supplied into the laid pipe, or any valved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.
 - c. Amount of leakage at the joints cannot exceed 2 quarts per 100 joints regardless of pipe diameter.
 - d. Apply hydrostatic tests to piping with concrete thrust blocking only after the concrete has cured for more than 7 calendar days.
 3. Test backflow prevention into connected potable-water systems and system devices for proper functioning under conditions normal to their application. Repair dripping or weeping joints.

3.06 ADJUSTING AND CLEANING

- A. At the completion of the work, clean all parts of the installation. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system. Adjust automatic control devices for proper operation.

3.07 PROTECTION

- A. Flushing
 1. Before overhead sprinkler piping can be connected to the underground piping, verification of an approved hydrostatic test and flush must be furnished.

END OF SECTION 21 1300

SECTION 21 13 00
FIRE SUPPRESSION SPRINKLER SYSTEMS

PART 1 – GENERAL

1.01 REFERENCES

- A. AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)
 - 1. ASSE 1013 (2011) Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers
 - 2. ASSE 1015 (2011) Performance Requirements for Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies
- B. AMERICAN WATER WORKS ASSOCIATION (AWWA)
 - 1. AWWA C104/A21.4 (2016) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
 - 2. AWWA C203 (2008) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
 - 3. AWWA M14 (2015) Manual: Recommended Practice for Backflow Prevention and Cross-Connection Control
- C. ASTM INTERNATIONAL (ASTM)
 - 1. ASTM A47/A47M (1999) Standard Specification for Ferritic Malleable Iron Castings
 - 2. ASTM A53/A53M (2020) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - 3. ASTM A183 (2014; R 2020) Standard Specification for Carbon Steel Track Bolts and Nuts
 - 4. ASTM A536 (1984) Standard Specification for Ductile Iron Castings
- D. FM GLOBAL (FM)
 - 1. FM APP GUIDE (updated on-line) Approval Guide <http://www.approvalguide.com/>
 - 2. FM 1637 (2010) Flexible Sprinkler Hose with Threaded End Fittings
- E. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
 - 1. NFPA 13 (2022) Standard for the Installation of Sprinkler Systems
 - 2. NFPA 24 (2019) Standard for the Installation of Private Fire Service Mains and Their Appurtenances
 - 3. NFPA 291 (2016) Recommended Practice for Fire Flow Testing and Marking of Hydrants
- F. UNDERWRITERS LABORATORIES (UL)

1.02 SYSTEM DESCRIPTION

- A. Hydraulic Design
 - 1. Basis for Calculations
 - a. Perform a fire hydrant flow test prior to shop drawing submittal in accordance with NFPA 291. Results must include hydrant elevations relative to the building and hydrant number/identifiers for the tested hydrants, including which were flowed, which had a gauge. This information must be presented in a tabular form if multiple hydrants were flowed. The results must be included with the hydraulic calculations. Hydraulic calculations must be based on flow test noted in this paragraph. Hydraulic calculations must be based upon the Hazen-Williams formula with a "C" value noted in NFPA 13 for piping.
 - 2. Hydraulic Calculations
 - a. Water supply curves and system requirements must be plotted on semi-logarithmic graph.
 - b. Provide a summary sheet listing sprinklers in the design area and their respective hydraulic reference points, elevations, minimum discharge pressures and minimum flows. Elevations of hydraulic reference points (nodes) must be indicated.

- c. Documentation must identify each pipe individually and the nodes connected thereto. Indicate the diameter, length, flow, velocity, friction loss, number and type fittings, total friction loss in the pipe, equivalent pipe length and Hazen-Williams coefficient for each pipe.
 - d. Where the sprinkler system is supplied by interconnected risers, the sprinkler system must be hydraulically calculated using the hydraulically most demanding single riser. The calculations must not assume the simultaneous use of more than one riser.
 - e. All calculations must include the backflow preventer manufacturer's stated friction loss at the design flow.
 - f. All calculations must be performed back to the actual location of the flow test, taking into account the direction of flow in the service main at the test location.
 - g. For gridded systems, calculations must show peaking of demand area friction loss to verify that the hydraulically most demanding area is being used. A flow diagram indicating the quantity and direction of flows must be included.
- 3. Design Criteria
 - a. Hydraulically design the system to discharge a minimum density as indicated on the drawings or must be in accordance with the Area/Density Method of NFPA 13. Add an allowance for exterior and interior hose streams as required by NFPA 13.
- B. Sprinkler Coverage
 - 1. Sprinklers must be uniformly spaced on branch lines. Provide coverage throughout 100 percent of the area noted on the Contract drawings. This includes, but is not limited to, telephone rooms, electrical equipment rooms (regardless of the fire resistance rating of the enclosure), boiler rooms, switchgear rooms, transformer rooms, attached electrical vaults and other electrical and mechanical spaces. Coverage per sprinkler must be in accordance with NFPA 13. Provide sprinklers below all obstructions in accordance with NFPA 13.
- C. Qualified Fire Protection Engineer (QFPE)
 - 1. An individual who is a licensed professional engineer (P.E.) who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveying (NCEES) and has relevant fire protection engineering experience.

1.03 SUBMITTALS

- A. Shop drawings, product data and calculations must be prepared by the designer and combined and submitted as one complete package. The QFPE must review the submittal package for completeness and compliance with the Contract provisions prior to submission.
- B. Submit the following:
 - 1. Shop Drawings
 - 2. Product Data
 - a. Pipe
 - b. Fittings
 - c. Valves, including gate, check, butterfly, and globe
 - d. Alarm Valves
 - e. Relief Valves
 - f. Sprinklers
 - g. Pipe hangers and Supports
 - h. Sprinkler alarm switch
 - i. Valve supervisory (tamper) switch
 - j. Fire department connection
 - k. Backflow prevention assembly
 - l. Air vent

- m. Hose valve
- n. Seismic bracing
- o. Nameplates
- 3. Design Data
 - a. Seismic bracing
 - b. Load calculations for sizing of seismic bracing
 - c. Hydraulic calculations
- 4. Test Reports
 - a. Test procedures
- 5. Certificates
 - a. Verification of Compliant Installation
- 6. Operation and Maintenance Data
 - a. Operating and Maintenance (O&M) Instructions
 - b. Spare Parts Data
- 7. Closeout Submittals
 - a. As-built drawings

1.04 QUALITY ASSURANCE

- A. Preconstruction Submittals - Within 36 days of contract award but no less than 14 days prior to commencing work on site, the prime Contractor must submit drawings, calculations and product data for review and approval.
 - 1. Shop Drawing -copies of the shop drawings, no later than 28 days prior to the start of system installation. Working drawings conforming to the requirements prescribed in NFPA 13. Each set of drawings must include the following:
 - a. A descriptive index with drawings listed in sequence by number. A legend sheet identifying device symbols, nomenclature, and conventions used in the package.
 - b. Floor plans drawn to a scale not less than 1/8-inch equals 1-foot clearly showing locations of devices, equipment, risers, and other details required to clearly describe the proposed arrangement.
 - c. Actual center-to-center dimensions between sprinklers on branch lines and between branch lines; from end sprinklers to adjacent walls; from walls to branch lines; from sprinkler feed mains, cross mains and branch lines to finished floor and roof or ceiling.
 - d. Longitudinal and transverse building sections showing typical branch line and cross main pipe routing, elevation of each typical sprinkler above finished floor and elevation of "cloud" or false ceilings in relation to the building ceilings.
 - e. Plan and elevation views which establish that the equipment will fit the allotted spaces with clearance for installation and maintenance.
 - f. Riser layout drawings drawn to a scale of not less than 1/2-inch equals 1-foot to show details of each system component, clearances between each other and from other equipment and construction in the room.
 - g. Details of each type of riser assembly, pipe hanger, sway bracing for earthquake protection, and restraint of underground water main at point-of-entry into the building, and electrical devices and interconnecting wiring. The dimension from the edge of vertical piping to the nearest adjacent wall(s) must be indicated on the drawings when vertical piping is located in stairs or other portions of the means of egress.
 - h. Details of each type of pipe hanger, seismic bracing/restraint and related components.
 - i. Include fire pump curve with shop drawings and hydraulic calculations, if applicable.
 - 2. Product Data
 - a. Annotated catalog data to show the specific model, type, and size of each item. The data must be highlighted to show model, size, options, and other pertinent

information, that are intended for consideration. Data must be adequate to demonstrate compliance with all contract requirements. Product data for all equipment must be combined into a single submittal.

3. Hydraulic Calculations
 - a. Calculations must be as outlined in NFPA 13 except that calculations must be performed by computer using software intended specifically for fire protection system design using the design data shown on the drawings.
 4. Operating and Maintenance Instructions
 - a. Provide 3 hard copy manuals and one pdf version on electronic media. The manuals must include the manufacturer's name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment.
- B. Qualifications
1. Sprinkler System Designer
 - a. The sprinkler system designer must be certified as a Level III Technician by National Institute for Certification in Engineering Technologies (NICET) in the Water-Based Systems Layout subfield of Fire Protection Engineering Technology.
 2. Sprinkler System Installer
 - a. The sprinkler system installer must be regularly engaged in the installation of the type and complexity of system specified in the contract documents, and must have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months.
- C. Regulatory Requirements
1. Equipment and material must be listed or approved. Listed or approved, as used in this Section, means listed, labeled or approved by a Nationally Recognized Testing Laboratory (NRTL) such as UL Fire Prot Dir or FM APP GUIDE. The omission of these terms under the description of an item or equipment described must not be construed as waiving this requirement. All listings or approvals by testing laboratories must be from an existing ANSI or UL published standard. The recommended practices stated in the manufacturer's literature or documentation are mandatory requirements.

1.05 Delivery, Storage, and Handling

- A. Protect all equipment delivered and placed in storage from the weather, excessive humidity and temperature variations, dirt and dust, or other contaminants. All pipes must be either capped or plugged until installed.

1.06 Extra Materials

- A. Spare sprinklers and wrench(es) must be provided as spare parts in accordance with NFPA 13.

PART 2 - Products

2.01 Materials and Equipment

- A. Standard Products
 1. Provide materials, equipment, and devices listed for fire protection service when so required by NFPA 13 or this specification. Select material from one manufacturer, where possible, and not a combination of manufacturers, for a classification of material. Material and equipment must be standard products of a manufacturer regularly engaged in the manufacture of the products for at least 2 years prior to bid.
- B. Nameplates
 1. Major components of equipment must have the manufacturer's name, address, type or style, model or serial number, catalog number, date of installation, installing Contractor's name and address, and the contract number provided on a new name plate permanently

affixed to the item or equipment. Nameplates must be etched metal or plastic, permanently attached by screws to control units, panels or adjacent walls.

- C. Identification and Marking
 - 1. Pipe and fitting markings must include name or identifying symbol of manufacturer and nominal size. Pipe must be marked with ASTM designation. Valves and equipment markings must have name or identifying symbol of manufacturer, specific model number, nominal size, name of device, arrow indicating direction of flow, and position of installation (horizontal or vertical), except if valve can be installed in either position. Markings must be included on the body casting or on an etched or stamped metal nameplate permanently on the valve or cover plate.
- D. Pressure Rating
 - 1. Valves, fittings, couplings, alarm switches, and similar devices must be rated for the maximum working pressures that can be experienced in the system, but in no case less than 175 psi.

2.02 Aboveground Piping Components

- A. Steel Piping Components
 - 1. Steel Pipe
 - a. Except as modified herein, steel pipe must be black as permitted by NFPA 13 and conform to the applicable provisions of ASTM A53, ASTM A135 or ASTM A153.
 - b. Steel pipe must be minimum Schedule 40 for sizes 2 inches and less; and minimum Schedule 10 for sizes larger than 2 inches.
 - 2. Fittings
 - a. Fittings must be welded, threaded, or grooved-end type. Threaded fittings must be cast-iron conforming to ASME B16.4, malleable-iron conforming to ASME B16.3 or ductile-iron conforming to ASTM A536. Plain-end fittings with mechanical couplings, fittings that use steel gripping devices to bite into the pipe, steel press fittings and field welded fittings are not permitted. Fittings, mechanical couplings, and rubber gaskets must be supplied by the same manufacturer. Threaded fittings must use Teflon tape or manufacturer's approved joint compound. Saddle tees using rubber gasketed fittings are permitted only when connecting to existing piping for additions or modifications. Saddle tees must use a connection method that completely wraps around the pipe. Reducing couplings are not permitted except as allowed by NFPA 13.
 - 3. Grooved Mechanical Joints and Fittings
 - a. Joints and fittings must be designed for not less than 175 psi service and the product of the same manufacturer. Field welded fittings must not be used. Fitting and coupling housing must be malleable-iron conforming to ASTM A47, Grade 32510; ductile-iron conforming to ASTM A536, Grade 65-45-12. Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 2 inches and larger. Gasket must be the flush type that fills the entire cavity between the fitting and the pipe. Nuts and bolts must be heat-treated steel conforming to ASTM A183 and must be cadmium-plated or zinc-electroplated.
 - 4. Flanges
 - a. Flanges must conform to NFPA 13 and ASME 816.1. Gaskets must be non-asbestos compressed material in accordance with ASME 816.21, 1/16-inch thick, and full face or self-centering flat ring type.
- B. Flexible Sprinkler Hose
 - 1. The use of flexible hose is permitted. Flexible sprinkler hose must comply with UL 2443 and FM 1637.
- C. Pipe Hangers and Supports

1. Provide galvanized pipe hangers, supports and seismic bracing in accordance with NFPA 13. Design and install seismic protection in accordance with the requirements of NFPA 13 section titled "Protection of Piping Against Damage Where Subject to Earthquakes for Seismic Design Category as designated by the Structural Engineer of Record.
- D. Valves
 1. Provide valves of types approved for fire service. Valves must open by counterclockwise rotation.
 2. Control Valve
 - a. Manually operated sprinkler control/gate valve must be outside stem and yoke (OS&Y) type or butterfly type as indicated on the drawings and must be listed.
 3. Check Valves
 - a. Check valves must comply with UL 312
 4. Hose Valve
 - a. Valve must comply with UL 668.

2.03 Alarm Initiating and Supervisory Devices

- A. Sprinkler Alarm Switch
 1. Vane or pressure-type flow switch(es). Connection of switch must be by the fire alarm installer. Vane type alarm actuating devices must have mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and must instantly recycle. Flow switches for elevator power shunt must not have a retard feature.
- B. Valve Supervisory (Tamper) Switch
 1. Switch must be integral to the control valve or suitable for mounting to the type of control valve to be supervised open.

2.04 Sprinklers

- A. Sprinklers must comply with UL 199 and NFPA 13. Sprinklers with internal O-rings are not acceptable. Sprinklers in high heat areas including attic spaces or in close proximity to unit heaters must have temperature classification in accordance with NFPA 13. Extended coverage sprinklers are permitted for loading docks, residential occupancies and high-piled storage applications only.
- B. Upright Sprinkler
 1. Upright sprinkler must be quick-response type and have a nominal K-factor of 5.6.
- C. Pendent Sprinkler
 1. Pendent sprinkler must be quick-response type and have a nominal K-factor of 5.6.
- D. Concealed Sprinkler
 1. Concealed sprinkler must be quick-response type and have a nominal K-factor of 5.6. Coverplate must match ceiling.
- E. Corrosion-Resistant Sprinkler
 1. Corrosion-resistant sprinkler to be installed in locations as indicated. Corrosion-resistant coatings must be factory-applied by the sprinkler manufacturer.

2.05 Accessories

- A. Sprinkler Cabinets
 1. Provide spare sprinklers in accordance with NFPA 13 and must be placed in a suitable metal or plastic cabinet of sufficient size to accommodate all the spare sprinklers and wrenches in designated locations. Spare sprinklers must be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed as required by NFPA 13. At least one wrench of each type required must be provided.
- B. Pendent Sprinkler Escutcheon
 1. Escutcheon must be one-piece metallic type with a depth of less than 3/4-inch and suitable for installation on pendent sprinklers. The escutcheon must have a factory finish that matches the pendent sprinkler.

- C. Pipe Escutcheon
 - 1. Provide split hinge metal plates for piping entering walls, floors, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on metal plates in unfinished spaces.
- D. Sprinkler Guard
 - 1. Listed guard must be a steel wire cage designed to encase the sprinkler and protect it from mechanical damage. Guards must be provided on sprinklers located within 7 feet of the floor and/or as indicated.
- E. Relief Valve
 - 1. Relief valves must be listed and installed at the riser in accordance with NFPA 13.
- F. Air Vent
 - 1. Air vents must be of the automatic type and piped to drain to the building exterior.
- G. Identification Sign
 - 1. Valve identification sign must be minimum 6 inches wide by 2 inches high with enamel baked finish on minimum 18 gage steel or 0.024-inch aluminum with red letters on a white background or white letters on red background. Wording of sign must include, but not be limited to "main drain", "auxiliary drain", "inspector's test", "alarm test", "alarm line", and similar wording as required to identify operational components. Where there is more than one sprinkler system, signage must include specific details as to the respective system.

PART 3 - Execution

3.01 Verifying Actual Field Conditions

- A. Before commencing work, examine all adjoining work on which the contractor's work that is dependent for perfect workmanship according to the intent of this specification section, and report to the Contracting Officer's Representative a condition that prevents performance of first class work. No "waiver of responsibility" for incomplete, inadequate or defective adjoining work will be considered unless notice has been filed before submittal of a proposal.

3.02 Installation

- A. The installation must be in accordance with the applicable provisions of NFPA 13, NFPA 24 and publications referenced therein. Locate sprinklers in a consistent pattern with ceiling grid, lights, and air supply diffusers. Install sprinkler system over and under ducts, piping and platforms when such equipment can negatively affect or disrupt the sprinkler discharge pattern and coverage.
 - 1. Piping offsets, fittings, and other accessories required must be furnished to provide a complete installation and to eliminate interference with other construction.
 - 2. Wherever the contractor's work interconnects with work of other trades the Contractor must coordinate with other Contractors to ensure all Contractors have the information necessary so that they may properly install all necessary connections and equipment.
 - 3. Provide required supports and hangers for piping, conduit, and equipment so that loading will not exceed allowable loadings of structure. Submittal of a bid must be a deemed representation that the contractor submitting such bid has ascertained allowable loadings and has included in his estimates the costs associated in furnishing required supports.
- B. Waste Removal
 - 1. At the conclusion of each day's work, clean up and stockpile on site all waste, debris, and trash which may have accumulated during the day as a result of work by the contractor and of his presence on the job. Sidewalks and streets adjoining the property must be kept broom clean and free of waste, debris, trash and obstructions caused by work of the contractor, which will affect the condition and safety of streets, walks, utilities, and property.

3.03 Aboveground Piping Installation

- A. The methods of fabrication and installation of the aboveground piping must fully comply with the requirements and recommended practices of NFPA 13 and this specification section.
- B. Protection of Piping Against Earthquake Damage
 - 1. Seismic restraint is required.
- C. Piping in Exposed Areas
 - 1. Install exposed piping without diminishing exit access widths, corridors or equipment access. Exposed horizontal piping, including drain piping, must be installed to provide maximum headroom.
- D. Piping in Finished Areas
 - 1. In areas with suspended or dropped ceilings and in areas with concealed spaces above the ceiling, piping must be concealed above ceilings. Piping must be inspected, hydrostatically tested and approved before being concealed. Risers and similar vertical runs of piping in finished areas must be concealed.
- E. Pendent Sprinklers
 - 1. Drop nipples to pendent sprinklers must consist of minimum 1-inch pipe with a reducing coupling into which the sprinkler must be threaded.
 - 2. Where sprinklers are installed below suspended or dropped ceilings, drop nipples must be cut such that sprinkler ceiling plates or escutcheons are of a uniform depth throughout the finished space. The outlet of the reducing coupling must not extend below the underside of the ceiling.
 - 3. Recessed pendent sprinklers must be installed such that the distance from the sprinkler deflector to the underside of the ceiling must not exceed the manufacturer's listed range and must be of uniform depth throughout the finished area.
 - 4. Pendent sprinklers in suspended ceilings must be located in the center of the tile (plus or minus 2 inches).
 - 5. Dry pendent sprinkler assemblies must be such that sprinkler ceiling plates or escutcheons are of the uniform depth throughout the finished space.
 - 6. Where the maximum static or flowing pressure, whichever is greater at the sprinkler, applied other than through the fire department connection, exceeds 100 psi and a branch line above the ceiling supplies sprinklers in a pendent position below the ceiling, the cumulative horizontal length of an unsupported arm-over to a sprinkler or sprinkler drop must not exceed 12 inches for steel pipe.
- F. Upright Sprinklers
 - 1. Riser nipples or "sprigs" to upright sprinklers must contain no fittings between the branch line tee and the reducing coupling at the sprinkler.
- G. Pipe Joints
 - 1. Pipe joints must conform to NFPA 13, except as modified herein. Not more than four threads must show after joint is made up. Welded joints will be permitted, only if welding operations are performed as required by NFPA 13 at the Contractor's fabrication shop, not at the project construction site. Flanged joints must be provided where indicated or required by NFPA 13. Grooved pipe and fittings must be prepared in accordance with the manufacturer's latest published specification according to pipe material, wall thickness and size. Grooved couplings, fittings and grooving tools must be products of the same manufacturer. For copper tubing, pipe and groove dimensions must comply with the tolerances specified by the coupling manufacturer. The diameter of grooves made in the field must be measured using a "go/no-go" gauge, vernier or dial caliper, narrow-land micrometer, or other method specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of pipe must be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances.

H. Reducers

1. Reductions in pipe sizes must be made with one-piece tapered reducing fittings. When standard fittings of the required size are not manufactured, single bushings of the face or hex type will be permitted. Where used, face bushings must be installed with the outer face flush with the face of the fitting opening being reduced. Bushings cannot be used in elbow fittings, in more than one outlet of a tee, in more than two outlets of a cross, or where the reduction in size is less than 1/2-inch.

I. Pipe Penetrations

1. Cutting structural members for passage of pipes or for pipe-hanger fastenings will not be permitted. Pipes that must penetrate concrete or masonry walls or concrete floors must be core-drilled and provided with pipe sleeves. Each sleeve must be Schedule 40 galvanized steel, ductile-iron or cast-iron pipe and extend through its respective wall or floor and be cut flush with each wall surface. Sleeves must provide required clearance between the pipe and the sleeve per NFPA 13. The space between the sleeve and the pipe must be firmly packed with mineral wool insulation.
2. Where pipes and sleeves penetrate fire walls, fire partitions, or floors, pipes/sleeves must be firestopped.
3. In penetrations that are not fire-rated or not a floor penetration, the space between the sleeve and the pipe must be sealed at both ends with plastic waterproof cement that will dry to a firm but pliable mass or with a mechanically adjustable segmented elastomer seal.

J. Escutcheons

1. Escutcheons must be provided for pipe penetration in finished areas of ceilings, floors and walls. Escutcheons must be securely fastened to the pipe at surfaces through which piping passes.

K. Inspector's Test Connection

1. Unless otherwise indicated, the test connection must consist of 1-inch pipe connected at the riser as a combination test and drain valve; a test valve located approximately 7 feet above the floor; a smooth bore brass outlet equivalent to the smallest orifice sprinkler used in the system; and a painted metal identification sign affixed to the valve with the words "Inspector's Test". All test connection piping must be inside of the building and penetrate the exterior wall at the location of the discharge orifice only. The discharge orifice must be located outside the building wall no more than 2 feet above finished grade, directed so as not to cause damage to adjacent construction or landscaping during full flow discharge, or to the sanitary sewer. Discharge to the exterior must not interfere with exiting from the facility. Water discharge or runoff must not cross the path of egress from the building. Do not discharge to the roof. Discharge to floor drains, janitor sinks or similar fixtures is not permitted.
2. Provide concrete splash block at drain and inspector's test connection discharge locations if not discharging to a concrete surface. Splash blocks must be large enough to mitigate erosion and not become dislodged during a full flow of the drain. Ensure all discharged water drains away from the facility and does not cause property damage.

L. Drains

1. Main drain piping must be provided to discharge at a safe point outside the building, no more than 2 feet above finished grade, or to the sanitary sewer where dictated by jurisdiction. Provide a concrete splash block at drain outlet. Discharge to the exterior must not interfere with exiting from the facility. Water discharge or runoff must not cross the path of egress from the building.
2. Auxiliary drains must be provided as required by NFPA 13. Auxiliary drains are permitted to discharge to a floor drain if the drain is sized to accommodate full flow (min 40 gpm). Discharge to service sinks or similar plumbing fixtures is not permitted.

M. Identification Signs

1. Signs must be affixed to each control valve, inspector test valve, main drain, auxiliary drain, test valve, and similar valves as appropriate or as required by NFPA 13.

3.04 Electrical

- A. Alarm signal wiring connected to the building fire alarm control system must be by the fire alarm installer.

3.05 Field Quality Control

- A. Correction of Deficiencies
 1. If equipment was found to be defective or non-compliant with contract requirements, perform corrective actions and repeat the tests. Tests must be conducted and repeated if necessary until the system has been demonstrated to comply with all contract requirements.

3.06 Minimum System Tests

- A. The system, including the underground water mains, and the aboveground piping and system components, must be tested to ensure that equipment and components function as intended. The underground and aboveground interior piping systems and attached appurtenances subjected to system working pressure must be tested in accordance with NFPA 13.
- B. Aboveground Piping
 1. Hydrostatic Test
 - a. Aboveground piping must be hydrostatically tested in accordance with NFPA 13. There must be no drop in gauge pressure or visible leakage when the system is subjected to the hydrostatic test. The test pressure must be read from a gauge located at the low elevation point of the system or portion being tested.
- C. Main Drain Flow Test
 1. Following flushing of the underground piping, a main drain test must be made to verify the adequacy of the water supply.

3.07 System Acceptance

- A. Following acceptance of the system, as-built drawings and O&M manuals must be delivered to the Contracting Officer for review and acceptance. Submit six sets of detailed as-built drawings. The drawings must show the system as installed, including deviations from both the project drawings and the approved shop drawings. These drawings must be submitted within two weeks after the final acceptance test of the system. At least one set of as-built (marked-up) drawings must be provided at the time of, or prior to the final acceptance test.
 1. Provide one set of full size paper as-built drawings and schematics. The drawings must be prepared electronically and sized no less than the contract drawings.
 2. Provide operating and maintenance (O&M) instructions.

3.08 Onsite Training

- A. Conduct a training course for the responding fire department and operating and maintenance personnel as designated by the Contracting Officer. The on-site training must cover all of the items contained in the approved Operating and Maintenance Instructions.

END OF SECTION 21 1313

**SECTION 22 0010
BASIC PLUMBING REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Basic Plumbing Requirements specifically applicable to Division 22 Sections, in addition to Division 01 - General Requirements.

1.02 DESCRIPTION

- A. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as required to complete the work of this section, except as otherwise herein specifically excluded.

1.03 WORK INCLUDED

- A. The complete Plumbing systems (including Fire Protection systems), including but not limited to these major items.
 - 1. Coordinate work of this Section with related trades.
 - 2. Furnishing and installation of miscellaneous hangers, supports, sleeves, inserts, anchors and other auxiliary equipment for systems under this Division.
 - 3. Soil waste and vent system inside and outside the building (5 feet) including connections to fixtures, equipment, sewer connections, clean-outs, drains.
 - 4. Roof drains and overflow drains along with piping inside and outside the building (5 feet).
 - 5. Water piping systems inside and outside the building (to 5 feet), including connections to fixtures, equipment, appliances, trap primers.
 - 6. Propane gas piping system.
 - 7. Plumbing fixtures, carriers, fittings, trim, hose bibs, wall hydrants, and accessories.
 - 8. Water heating systems, including water heating equipment, circulating pumps, expansion tank, connections.
 - 9. Oil Clarifier including manhole systems
 - 10. Shop drawings.
 - 11. Equipment identification.
 - 12. Equipment and systems adjustments and balancing.
 - 13. Written operating and maintenance instructions.
 - 14. Record drawings.
 - 15. Guarantee

1.04 WORK SPECIFIED ELSEWHERE

- A. Concrete, Rough Carpentry, Joint Sealants, Sheet Metal, Flashing and Trim, access doors and Frames, Door Hardware, Paints and Coatings, Mechanical and Electrical.

1.05 SITE INSPECTION

- A. Contractor shall familiarize himself with the conditions at the site. No allowance will be made subsequently for any error through negligence in observing the site conditions. Contractor shall observe and make cost allowance for any mechanical and/or electrical items that must be relocated to accommodate the installation or servicing of any item covered under this contract.

1.06 ORDINANCES, REGULATIONS AND CODES

- A. References to Technical Societies, Trade Organizations, Governmental Agencies is made in Division 15 in accordance with the following abbreviations.
 - 1. AFI - Air Filter Institute
 - 2. AMCA - Air Moving & Conditioning Association
 - 3. ARI - Air Conditioning & Refrigeration Institute
 - 4. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
 - 5. ASME - American Society of Mechanical Engineers
 - 6. ASTM - American Society of Testing Materials

7. AWS - American Welding Society Code
 8. ANSI - American National Standards Institute
 9. CBC - California Building Code
 10. CCR - California Code of Regulations
 11. CEC - California Electrical Code
 12. CFC - California Fire Codes
 13. CMC - California Mechanical Code
 14. CPC - California Plumbing Code
 15. FIA - Factory Insurance Association
 16. NAFM - National Association of Fan Manufacturers
 17. NEMA - National Electrical Manufacturer's Association
 18. NFPA - National Fire Protection Association
 19. ORS - Office of Regulatory Services
 20. SCAQMD - South Coast Air Quality Management District
 21. SMACNA - Sheet Metal and Air Conditioning Contractors National Association
 22. UL - Underwriter's Laboratories
- B. Requirements of Regulatory Agencies: Materials and installation shall comply with applicable state codes. Rulings and interpretations of the enforcing agencies shall be considered as part of the local codes. No extras will be permitted for furnishing items required by the local codes but not specified or shown on the drawings.
- C. Codes and Standards:
1. IBC and California Amendments (California Building Code - Part 2, Title 24, CCR).
 2. UMC and California Amendments (California Mechanical Code - Part 4, Title 24 CCR).
 3. UPC and California Amendments (California Plumbing Code - Part 5, Title 24 CCR).
 4. International Fire Code with State Amendments (California Fire Code - Part 9, Title 24 CCR).
 5. National Fire Protection Associations.
- D. Nothing in these drawings and specifications is to be construed to permit work in violation thereof. Ordinances, regulations and codes are to be construed as minimum requirements.
- E. The responsibility of the Architect to conduct construction reviews of the Contractor's performance is not intended to include the adequacy of the Contractor's safety measures in, on, or near the construction site.
- F. Ventilating, refrigeration and electrical equipment and appliances are required to be approved by the Underwriters' Laboratories, Inc., or other nationally recognized testing agency and installed per the testing agency's specifications.

1.07 PERMITS, FEES AND INSPECTIONS

- A. Obtain and pay for all necessary permits, fees, assessments, complimentary drawings, required by any legally constituted public authorities having jurisdiction.

1.08 DRAWINGS AND SPECIFICATIONS

- A. The Architect's decision will be final on interpretation of the Drawings and Specifications.
- B. The Drawings and Specifications are complimentary. Any work called for on the Drawings and not mentioned in the Specifications, or vice versa, shall be performed as though fully set forth in both.
- C. Piping and other equipment shown as existing has been taken from the Owner's drawings. Contractor shall verify exact location in field before proceeding with the work.
- D. Where codes, standards, drawings or specifications conflict, the most stringent shall prevail, unless prior approval for variance is obtained. Specific details on the drawings shall supersede the specification in the event of a conflict.

- E. Alternate support or seismic detail proposed by contractor shall have prior approval by the Architect; and the Contractor shall obtain agency approval without any additional cost or time to the contract and without any time penalty on the work schedule.

1.09 SUBMITTALS

- A. Before starting work, the Contractor shall furnish for the review of the Architect and Engineer. Provide Shop Drawings and Submittals with Itemized Equipment Lists, complete in all details that they proposes to install. All items shall be submitted at the same time.
- B. Submittals must be specific to this project with respect to model number, capacities, performance, etc., generic submittals will not be accepted.
- C. Variations or deviations on submitted items from that specified must be clearly tagged and / or identified.
- D. Submittals shall include, but not necessarily be limited to the following which are mandatory:
 - 1. Draw Equipment Layouts to 1/4" scale, including equipment, piping accessories, and showing clearances for operating and servicing.
 - 2. Schedule of pipe, fittings, valves, with manufacturer and catalog number.
 - 3. Specialties, valves, gauges and thermometers of all types.
 - 4. Foundations, supports, hangers, inserts.
 - 5. Earthquake supports and calculations.
 - 6. Insulation.
 - 7. Shop fabrication drawings and installation drawings of piping layouts. Submit for approval prior to fabrication. Drawings shall indicate dimensions from bottom of piping to finish floor level.
 - 8. Wiring diagrams, control panel board, motor starters and controls for electrically operated equipment furnished by mechanical trades.
 - 9. Drains.
 - 10. Access panels.
 - 11. Clean-outs
 - 12. Trap primers.
 - 13. Fixture carriers.
 - 14. Hangers, inserts, supports, anchors.
 - 15. Hose bibs.
 - 16. Hot water circulators.
 - 17. Clarifiers
 - 18. Pipe, fittings and specialties.
 - 19. Plumbing fixtures, fittings, trim, drains and receptors.
 - 20. Roof flashing.
 - 21. Sleeves, escutcheons, caulking, waterproofing, fireproofing.
 - 22. Water hammer arrestors.
 - 23. Water heating equipment.
 - 24. Shop fabrications drawings and calculations.
 - 25. Special and miscellaneous products furnished under this section and not listed herein.

1.10 RECORD DRAWINGS AND MANUALS

- A. Record Set During the Work: At site, maintain at least one set of Drawings as a Field Record Set. Also maintain at least one copy of all Addenda, Modifications, approved submittals, correspondence, and transmittals at site. Keep Drawings and data in good order and readily available to Architect and Owner.
- B. Changes: Clearly and correctly mark Record Drawings to show changes made during the construction process at the time the changed work is installed. No such changes shall be made in the work unless authorized by the Architect.
- C. Final Record Drawings: Conform to Division 1 requirements.

- D. Preparation of Final Record Drawings: Contractor shall transfer recorded changes in the work indicated on the Field Record Set to the record set. Changes shall be neatly and clearly drawn and noted by skilled draftsmen, and shown technically correct.
- E. Approval: Prior to Architect's inspection for Substantial Completion, submit the Final Record Drawings to the Architect for review, and make such revisions as may be necessary for Final Record Drawings to be a true, complete, and accurate record of the work.
- F. Manuals: Obtain data from the various manufacturers and submit instruction, operation, and maintenance manuals as required and to the extent required under other Sections.
- G. Contents: Each manual shall have an index listing the contents. Information in the manuals shall include not less than:
 - 1. General introductions and overall equipment description, purpose, functions and simplified theory of operation.
 - 2. Specifications
 - 3. Installation instructions, procedures, sequences, and precautions, including tolerances for level, horizontal and vertical alignment.
 - 4. Grouting requirements.
 - 5. List showing lubricants for each item of mechanical equipment and recommended lubrication intervals.
 - 6. Start-up and beginning operation procedures.
 - 7. Operational procedures.
 - 8. Shutdown procedures.
 - 9. Maintenance and calibration procedures
 - 10. Parts lists
 - 11. Name, address and telephone number of each manufacturer's local representative.
- H. Manual Submittals: Unless otherwise specified, each submittal shall include two copies of each manual, one of which will be returned to the Contractor, marked to show the required review. When approved, deliver four copies to Architect unless otherwise specified.

1.11 QUALITY OF EQUIPMENT, MATERIALS AND WORKMANSHIP

- A. Unless otherwise specified, equipment and materials used in the installation shall be new and in perfect condition when installed. Articles provided for the same general purpose or use shall be of the same make. Workmanship shall be of the best quality and none but competent mechanics skilled in their trades shall be employed. Furnish the services of an experienced superintendent, who shall be constantly in charge of the work, together with all necessary journeymen, helpers and laborers required.

1.12 SEISMIC DESIGN

- A. Contractor shall be responsible for anchors and connections of mechanical work to the building structure including calculations for approval by structural engineer or for approval by inspector of record, as applies, for items or work, where approval is deferred or where alternate support or anchorage detail is proposed to prevent damage as a result of an earthquake, including manufactured equipment, the connection and integrity of shop fabricated and field fabricated materials and equipment. The anchorage of all pipes, ducts, conduits, fixtures, equipment, etc. shall withstand the lateral forces and shall accommodate calculated building displacement as required by the California Building Code, and local city/county codes. (Building equipment and connections therefore shall be designed to resist lateral seismic forces equal to 1.0 of equipment weight to working allowable stress. Cantilever posts supporting equipment shall be designed to resist lateral seismic forces equal to 0.5 of equipment weight to allowable working stress. Conform to the following:
 - 1. In accordance with Title 24, 202 CBC Chapter 16A, details shall be provided for the seismic anchorage of all mechanical and electrical equipment, anchorage details shall be based upon appropriate design calculations.

2. For equipment weighing 400 pounds or more anchorage details and appropriate design calculations shall be submitted as part of the mechanical and electrical drawings. "Deferred Approval" items will not be permitted unless specifically approved by the plan check supervisor.
 - a. Exception: Attachments of equipment weighing less than 400 pounds and supported directly on the floor or roof structure, furniture, or temporary or movable equipment and equipment weighing less than 20 pounds that is supported by vibration isolation devices suspended from the roof, wall or floor, need not be detailed on the plans provided the following notes are included on the mechanical and electrical plans.
3. The seismic anchorage of mechanical and electrical equipment shall conform to C.C.R. Title 24, 2022 CBC Chapter 16A. Anchorage details for roof/floor-mounted equipment shall be shown on plans.

1.13 SUBSTITUTIONS AND CHANGES

- A. The design has been based on data from certain manufacturers, suitable for each application. Recommendations for alternative manufacturers are made for each product, except when "no substitutions permitted" is indicated.
- B. It is the intent of the Owner to have this project constructed with materials, products and system originally designed and specified into the project.
- C. Alternatives that may require the modification, realignment and/or adjustment of other associated components, including impact on other trades, shall be accomplished at no additional cost or time to the contract and shall have the approval of the Architect.
- D. Substitutions shall be submitted addressing all features listed in the specifications. Features that deviate from the plans and specifications shall be clearly identified including justification for deviations. Design West Engineers will review initial submittal on substitutes only. Subsequent submittals made to correct deficiencies in original submittals will be reviewed at Contractor's expense based on Design West Engineer's hourly rate for engineering services.
- E. Should the Contractor elect to propose substitutions for the Owner's interest, the substitutions shall be in compliance with Division 01.

1.14 SUBMITTAL REVIEWS

- A. The Architect will have the right to accept or reject equipment, materials, workmanship, tests and determine when the Contractor has complied with the requirements herein specified.

1.15 SELECTION AND ORDERING OF EQUIPMENT AND MATERIALS

- A. Immediately after award of the Contract and after the final review of submittals by the Architect and / or Engineer, the Contractor shall arrange for the purchase and delivery of equipment and materials required, in ample quantities and at the proper time to meet construction schedule. The contractor shall deliver to the Architect and Owner a complete list of equipment and materials ordered, giving descriptions, plate numbers, brochures, name of the wholesalers, date of the orders and approximate delivery dates.

1.16 LOCATIONS AND ACCESSIBILITY

- A. Drawings show pipe and ductwork diagrammatically. Conform to Drawings as closely as possible in layout work. Vary run of piping, run and shape of ductwork and make offsets during progress of work as required to meet structural and other interferences as reviewed by Architect and / or Engineer. Install piping and ductwork to best suit field conditions after coordinating with other trades. Run exposed piping and ductwork parallel to, or at right angle to, building walls. Keep horizontal lines as close to bottom of structures as possible. Conform to ceiling heights established on Drawings.
- B. Install equipment in such a manner as to be readily accessible for maintenance and repairs. Install piping, ducts and conduit in such a manner as to preserve headroom, avoid obstructions and keep openings and passageways clear.

- C. Installation at valves, thermometers, gauges, cleanouts, dampers, controls, steam and water specialties, duct access doors or any other indicating equipment or specialties requiring reading, adjustment, inspection, maintenance shall be conveniently and accessible located with reference to the finished building.
- D. Where wall and ceiling access doors are required but not shown, such doors shall be furnished under other sections and as directed by the Architect. Coordinate this requirement with appropriate trade.
- E. If changes in the indicated locations or arrangements are required, they shall be made without additional charges.
- F. In an existing area, where required, remove, reinstall, reconnect or replace, etc., any existing work to accommodate new work without any additional cost to the Owner. Material shall match existing, unless otherwise specified or approved in writing by the Architect.

1.17 COORDINATION OF TRADES

- A. Contractor shall coordinate all trades in the interest of obtaining the most practical overall arrangement of equipment, piping, conduit, and ducts and to maintain maximum headroom and accessibility.
- B. No extras will be allowed for changes made necessary by interference or coordination between trades.
- C. Submit Composite Coordination Drawings in accordance with Special Conditions. Include dimensioned plans, elevations, sections and details and give complete information particularly as to the kinds and types of materials and equipment, size and location of sleeves, inserts, attachments, chases, openings, conduits, ducts, boxes, lighting, structural interferences. Coordinate these Composite Coordination Drawings and field layouts in the field for proper relationship to work of applicable trades based on field conditions. Contractor shall have competent personnel readily available for coordinating, checking, and supervision of field layouts. The procedures for submittals and resubmittals, and final distribution shall be as specified in Division 01. Do not start installation of work involved under Composite Coordination Drawings until the Architect and Engineer reviews applicable submittal. Discrepancies between the Drawings and Composite Coordination Drawings shall be specifically noted and identified on the Composite Coordination Drawings. Drawings for the various trades involved shall be submitted as required and reviewed prior to preparation of Composite Coordination Drawings.
 - 1. Equipment Foundations and Bases: Furnish certified details and drawings for approval before fabrication. Furnish parts necessary for each foundation sub base and support.
 - 2. Pipe Sleeves and Inserts: Furnish and install pipe sleeves and pipe support inserts before concrete is poured.
 - 3. Roof, Wall and Floor Openings: Furnish Shop Drawings showing exact locations and sizes of openings through roofs, walls and floors.
 - 4. Concrete: Conform to Concrete Section of the Specifications.

1.18 GUARANTEES

- A. Contractor shall guarantee workmanship, equipment and materials installed under his contract for a period of not less than one (1) year from the date of Substantial Completion. Should any defects occur during this period, the Contractor shall promptly repair or replace the defective item and any other damage caused to the building free of charge to the Owner, including cost of labor and materials.
- B. Guarantee included in this section to cover:
 - 1. Faulty or inadequate design of equipment or material installed
 - 2. Improper assembly or erection
 - 3. Defective workmanship or material
 - 4. Incorrect or inadequate operation or other failure

- C. The Contractor shall guarantee the complete and perfect operation of the entire system and that equipment will be supported in such a way as to be free of objectionable vibration and noise
- D. Furnish the parts and labor to replace any items found to be defective in the refrigeration equipment with the guarantee period
- E. For equipment bearing a manufacturer's warranty in excess of one year, furnish a copy of the warranty and proof of shipment date or purchase date per terms of warranty to the Owner, who shall be named as beneficiary.

1.19 PROTECTION OF EQUIPMENT AND MATERIALS

- A. Provide adequate storage facilities for equipment and materials on the site and shall make provisions to protect such materials and equipment from damage.

1.20 CLOSING-IN OF UNINSPECTED WORK

- A. Contractor shall not allow or cause any of the work, specifically ductwork and piping, to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Should any of work be covered up or enclosed before such inspection and test, shall at their own expense, uncover the work and after it has been inspected, tested, and approved, make repairs with such materials as may be necessary to restore work to its original and proper condition.

1.21 BUILDING FOOTING CLEARANCES

- A. Under no circumstances shall pipes, ducts, or conduits penetrate footings. They shall cross below footings or through sleeves above footings or as per structural details. Those running parallel to footings shall have the minimum clearance from the cone of influence indicated on the Drawings or as required by Code.

1.22 DAMAGE BY LEAKS

- A. Contractor shall be responsible for all damage to any part of the premises caused by rain leaks through or around ducts or pipes, leaks or breaks in piping, equipment or fixtures furnished or installed by him for a period of one (1) year from the date of Substantial Completion.

1.23 EQUIPMENT LABELS

- A. Equipment provided under this Section shall be provided with the manufacturer's metal identification labels attached to each individual piece of equipment showing complete performance characteristics, size, model and serial number.

1.24 EXCAVATION, TRENCHING AND BACKFILLING

- A. Excavating, trenching and backfilling for utilities within the building area shall be done in conformity with Division 31 - Sitework. Piping shall be installed promptly after excavation in order to keep the trenches open as short a time as possible.
- B. Excavating, trenching and backfilling for utilities outside the building area shall be done in conformity with Division 31 - Earth work.
- C. Any existing underground piping and conduit that is encountered shall be properly shored and protected from damage. Active piping shall be left intact and undamaged.

1.25 PRELIMINARY OPERATION

- A. Should the Owner request that any portion of the plant, apparatus, or equipment be operated for the Owner's beneficial use prior to the final completion and acceptance of the work, the Contractor shall conform to Beneficial Occupancy Provisions of the General Conditions. Such operation shall be under the supervision and direction of the Contractor. Such preliminary operation shall not be construed as an acceptance of any of the work.

1.26 ELECTRICAL WORK

- A. Coordinate with Division 26 in making the line and low voltage electrical connections and be responsible for the operation of the equipment furnished under this section.

- B. Voltage for electrical work will be included in Division 26. However, any control wiring which is required that is not shown on the control diagram shall be as described under this Section. In the event that the Contractor chooses to provide equipment that requires extra expense in the power or control wiring, he shall pay additional electrical costs.
- C. Safety switches, starters, circuit breakers, unless provided as a portion of package equipment, and the electrical connections of mechanical equipment to the electrical power service shall be provided under Division 26.
- D. Interconnecting wiring, safety switches, relays, controllers and motor starters which are integral components of packaged equipment shall be provided as an integral part of that equipment.
- E. All interconnecting power wiring and conduits shall be provided by Division 26.
- F. Control wiring shall be provided by Division 22, unless otherwise indicated on the drawings.
- G. Conduit for control wiring shall be provided by Division 26.

END OF SECTION 22 0010

SECTION 22 05 17
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Sleeve-seal systems.
 - 3. Grout.

1.02 ACTION SUBMITTALS

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

PART 2 PRODUCTS

2.01 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

2.02 SLEEVE-SEAL SYSTEMS

- A. Manufactures: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - 1. Advance Products & Systems, Inc
 - 2. CALPICO, Inc
 - 3. Metraflex Company
 - 4. Pipeline Seal and Insulator, Inc
 - 5. 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.
 - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.03 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Non-shrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 EXECUTION

3.01 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 (25-mm) 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 (50 mm) above finished floor level.
 - 2. 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 (6.4-mm) 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."

3.02 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.

3.03 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 (DN 150): Cast-iron wall sleeves.
 - b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves.
 - 2. Exterior Concrete Walls below Grade:
 - a. Piping Smaller than NPS 6 (DN 150): Cast-iron wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
 - b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves with sleeve-seal system.
 - 2) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
 - 3. Concrete Slabs-on-Grade:
 - a. Piping Smaller than NPS 6 (DN 150): Cast-iron wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
 - b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves with sleeve-seal system.
 - 2) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
 - 4. Concrete Slabs above Grade:
 - a. Piping Smaller than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.
 - b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-pipe sleeves.

5. Interior Partitions:
 - a. Piping Smaller than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.
 - b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 22 0517

SECTION 22 05 18
ESCUTCHEONS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.
 - 2. Floor plates.

1.02 ACTION SUBMITTALS

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

PART 2 PRODUCTS

2.01 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.02 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 EXECUTION

3.01 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 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. Insulated Piping: One-piece, stamped-steel type.
 - 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 at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
 - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
 - j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with rough-brass finish.
 - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.
- 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.

3.02 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 22 0518

SECTION 22 05 23
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Brass ball valves.
 - 2. Bronze ball valves.
 - 3. Iron, single-flange butterfly valves.
 - 4. Bronze swing check valves.
 - 5. Iron swing check valves.
 - 6. Iron swing check valves with closure control.
 - 7. Bronze gate valves.
 - 8. Iron gate valves.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of valve indicated.

1.03 QUALITY ASSURANCE

- A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
- B. NSF Compliance: NSF 61 for valve materials for potable-water service.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:
 - 1. Gate Valves: With rising stem.
 - 2. 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.
- E. Valve-End Connections:
 - 1. Flanged: With flanges according to ASME B16.1 for iron valves.
 - 2. Solder Joint: With sockets according to ASME B16.18.
 - 3. Threaded: With threads according to ASME B1.20.1.

2.02 BRASS BALL VALVES

- A. One-Piece, Reduced-Port, Brass Ball Valves with Brass Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Kitz Corporation.
 - b. Nibco
 - 2. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 400 psig (2760 kPa).
 - c. Body Design: One piece.
 - d. Body Material: Forged brass.
 - e. Ends: Threaded.
 - f. Seats: PTFE or TFE.
 - g. Stem: Brass.

- h. Ball: Chrome-plated brass.
 - i. Port: Reduced.
- B. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.
 - c. Hammond Valve.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.
 - 2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig (1035 kPa).
 - c. CWP Rating: 600 psig (4140 kPa).
 - d. Body Design: Two piece.
 - e. Body Material: Forged brass.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Brass.
 - i. Ball: Chrome-plated brass.
 - j. Port: Full.
- C. Two-Piece, Regular-Port, Brass Ball Valves with Brass Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hammond Valve.
 - b. Milwaukee Valve Company.
 - 2. Description:
 - c. Standard: MSS SP-110.
 - d. SWP Rating: 150 psig (1035 kPa).
 - e. CWP Rating: 600 psig (4140 kPa).
 - f. Body Design: Two piece.
 - g. Body Material: Forged brass.
 - h. Ends: Threaded.
 - i. Seats: PTFE or TFE.
 - j. Stem: Brass.
 - k. Ball: Chrome-plated brass.
 - l. Port: Regular.

2.03 BRONZE BALL VALVES

- A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. Crane Co.; Crane Valve Group; Crane Valves.
 - a. Hammond Valve.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.
 - 2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig (1035 kPa).
 - c. CWP Rating: 600 psig (4140 kPa).
 - d. Body Design: Two piece.

- e. Body Material: Bronze.
- f. Ends: Threaded.
- g. Seats: PTFE or TFE.
- h. Stem: Bronze.
- i. Ball: Chrome-plated brass.
- j. Port: Full.

2.04 BRONZE SWING CHECK VALVES

- A. Class 125, Bronze Swing Check Valves with Bronze Disc:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Hammond Valve.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.
 - 2. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.

2.05 IRON SWING CHECK VALVES

- A. Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Stockham Division.
 - 2. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Design: Clear or full waterway.
 - d. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - e. Ends: Flanged.
 - f. Trim: Composition.
 - g. Seat Ring: Bronze.
 - h. Disc Holder: Bronze.
 - i. Disc: PTFE or TFE.
 - j. Gasket: Asbestos free.

2.06 BRONZE GATE VALVES

- A. Class 125, NRS Bronze Gate Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Hammond Valve.
 - f. Milwaukee Valve Company.
 - g. NIBCO INC.
 - 2. Description:
 - a. Standard: MSS SP-80, Type 1.

- b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded or solder joint.
 - e. Stem: Bronze.
 - f. Disc: Solid wedge; bronze.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron, bronze, or aluminum.
- B. Class 125, RS Bronze Gate Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Hammond Valve.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.
 - 2. Description:
 - a. Standard: MSS SP-80, Type 2.
 - b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded or solder joint.
 - e. Stem: Bronze.
 - f. Disc: Solid wedge; bronze.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 EXECUTION

3.01 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. Shut-off valves shall be provided in main branches, runs to risers and where indicated on drawings
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.
- F. Install on operators for butterfly valves NPS 4 (DN 100) and larger and more than 96 inches (2400 mm) above floor. Extend chains to 60 inches (1520 mm above finished floor).
 - 1. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

3.02 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.

3.03 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball or butterfly valves.
 - 2. Throttling Service: ball, or butterfly valves.
 - 3. Pump-Discharge Check Valves:
 - a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with bronze disc.
 - b. NPS 2-1/2 (DN 65) and Larger for Domestic Water: Iron swing check valves with lever and weight or with spring.

- c. NPS 2-1/2 (DN 65) and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
 - 1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
 - 4. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.

3.04 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 (DN 50) and Smaller:
 - 1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. Bronze Angle Valves: Class 125, bronze disc.
 - 3. Ball Valves: Two piece, full port, brass or bronze with brass trim.
 - 4. Bronze Swing Check Valves: Class 125, bronze or nonmetallic disc.
- B. Pipe NPS 2-1/2 (DN 65) and Larger:
 - 1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to NPS 100): May be provided with threaded ends instead of flanged ends.
 - 2. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.
 - 3. Iron Swing Check Valves: Class 125, nonmetallic-to-metal seats.
 - 4. Iron Swing Check Valves with Closure Control: Class 125, lever and spring.
 - 5. Iron Gate Valves: Class 125 OS&Y.
 - 6. Iron Globe Valves: Class 125.

3.05 SANITARY-WASTE AND STORM-DRAINAGE VALVE SCHEDULE

- A. Pipe NPS 2 (DN 50) and Smaller:
 - 1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. Ball Valves: Two piece, full port, brass or bronze with brass trim.
 - 3. Bronze Swing Check Valves: Class 125, bronze disc.
 - 4. Bronze Gate Valves: Class 125, NRS.
- B. Pipe NPS 2-1/2 (DN 65) and Larger:
 - 1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to NPS 100): May be provided with threaded ends instead of flanged ends.
 - 2. Iron Swing Check Valves: Class 125, nonmetallic-to-metal seats.
 - 3. Iron Swing Check Valves with Closure Control: Class 125, lever and spring.
 - 4. Iron Gate Valves: Class 125, OS&Y.

END OF SECTION 22 0523

SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Thermal-hanger shield inserts.
 - 4. Fastener systems.
 - 5. Pipe positioning systems.
 - 6. Equipment supports.

1.02 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 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.

1.03 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. Equipment supports.
- C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.04 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.05 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

2.01 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: Pre-galvanized 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. 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.

2.02 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.

2.03 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig (688-kPa), ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) 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 (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.04 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.

2.05 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.06 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.07 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, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
1. Properties: Non-staining, noncorrosive, and nongaseous.
 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 EXECUTION

3.01 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 mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. 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.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. 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 (DN 65) 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.
- K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. 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.
- M. 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.
 - d. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) 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.
 - e. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:
 - f. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
 - g. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
 - h. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.02 EQUIPMENT SUPPORTS

- A. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- B. Provide lateral bracing, to prevent swaying, for equipment supports.

3.03 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.

3.04 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 (40 mm).

3.05 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 (0.05 mm).
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099113 "Exterior Painting." And 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.

3.06 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 trapeze pipe hangers and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- G. Use padded hangers for piping that is subject to scratching.
- 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 non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
 - 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 - 7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
 - 9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- 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 (DN 24 to DN 600).
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.
- 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 (150 mm) for heavy loads.
 - 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) 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. 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. 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:
 - i. Light (MSS Type 31): 750 lb (340 kg).
 - j. Medium (MSS Type 32): 1500 lb (680 kg).
 - k. Heavy (MSS Type 33): 3000 lb (1360 kg).
8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- M. 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.
- N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
 2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 3. 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.
- O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- P. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.
- Q. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 22 0529

SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe markers.
- E. Ceiling tacks.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems 2015.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Heat Transfer Equipment: Nameplates.
- B. Piping: Pipe markers.
- C. Pumps: Nameplates.
- D. Small-sized Equipment: Tags.
- E. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.02 MANUFACTURERS

- A. Brady Corporation: www.bradycorp.com.
- B. Champion America, Inc: www.Champion-America.com.
- C. Seton Identification Products: www.seton.com/aec.

2.03 NAMEPLATES

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.pipemarker.com/#sle.
 - 2. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - 3. Seton Identification Products: www.seton.com/#sle.
- B. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/4 inch (6 mm).
 - 3. Background Color: Black.

2.04 TAGS

- A. Manufacturers:
 - 1. Advanced Graphic Engraving: www.advancedgraphicengraving.com/#sle.
 - 2. Brady Corporation: www.bradycorp.com/#sle.
 - 3. Brimar Industries, Inc: www.pipemarker.com/#sle.
 - 4. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - 5. Seton Identification Products: www.seton.com/#sle.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

2.05 STENCILS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradycorp.com/#sle.
 - 2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com/#sle.
 - 3. Seton Identification Products: www.seton.com/#sle.
- B. Stencils: With clean cut symbols and letters of following size:
 - 1. 3/4 to 1-1/4 inch (20-30 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 1/2 inch (15 mm) high letters.
 - 2. 1-1/2 to 2 inch (40-50 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 3/4 inch (20 mm) high letters.
 - 3. 2-1/2 to 6 inch (65-150 mm) Outside Diameter of Insulation or Pipe: 12 inch (300 mm) long color field, 1-1/4 inch (30 mm) high letters.
- C. Stencils shall be identified as indicated below including direction of flow
 - 1. Gravity Condensate - G.C.
 - 2. Domestic Cold Water - D.C.W.
 - 3. Domestic Hot Water - D.H.W.
 - 4. Domestic Hot Water Return - D.H.W.R.
- D. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.

2.06 PIPE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradycorp.com/#sle.
 - 2. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - 3. Seton Identification Products: www.seton.com/#sle.
- B. Comply with ASME A13.1.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil (0.10 mm) thick, manufactured for direct burial service.

2.07 CEILING TACKS

- A. Manufacturers:
 - 1. Craftmark: www.craftmarkid.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: Steel with 3/4 inch (20 mm) diameter color coded head.
- C. Color code as follows:
 - 1. Plumbing Valves: Green.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Apply stencil painting in accordance with Section 09 91 23.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

- E. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- F. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.
 - 3. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- G. Identify valves in main and branch piping with tags.
- H. Identify piping, concealed or exposed, with pipe markers. Use tags on piping 3/4 inch (20 mm) diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION 22 0553

**SECTION 22 07 19
PLUMBING PIPING INSULATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.02 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
- C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.
- D. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation 2017.
- E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2019.
- F. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation 2017, with Editorial Revision (2018).
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or ASTM E84.

2.02 GLASS FIBER

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com.
 - 2. Johns Manville Corporation: www.jm.com.
 - 3. Knauf Insulation: www.knaufusa.com.
 - 4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com/#sle.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).

2. Maximum Service Temperature: 850 degrees F (454 degrees C).
3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).

2.03 JACKETS

- A. PVC Plastic:
 1. Manufacturers:
 - a. Johns Manville Corporation: www.jm.com.
 2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
 - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
 - c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil (0.25 mm).
 - e. Connections: Brush on welding adhesive.
- B. ABS Plastic:
 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 - b. Maximum Service Temperature: 180 degrees F (82 degrees C).
 - c. Moisture Vapor Permeability: 0.012 perm inch (0.018 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 30 mil (0.76 mm).
 - e. Connections: Brush on welding adhesive.
- C. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
 1. Thickness: 0.016 inch (0.40 mm) sheet.
 2. Finish: Smooth.
 3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
 4. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.
 5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Install insulation on piping accessories requiring future re-occurring access and service with factory fabricated insulation covers that are easily removed and reapplied
- F. Glass fiber insulated pipes conveying fluids below ambient temperature:
 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- G. Glass fiber insulated pipes conveying fluids above ambient temperature:
 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- H. Inserts and Shields:
 1. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 2. Insert Location: Between support shield and piping and under the finish jacket.
 3. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
- I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.
- J. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULES - SEE SHEETS P0.01

END OF SECTION 22 0719

**SECTION 22 1005
PLUMBING PIPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
 - 1. Sanitary sewer and vent.
 - 2. Domestic water.
 - 3. Storm water.
 - 4. Propane gas.
 - 5. Flanges, unions, and couplings.
 - 6. Pipe hangers and supports.
 - 7. Valves.
 - 8. Flow controls.
 - 9. Relief valves.
 - 10. Strainers.

1.02 REFERENCE STANDARDS

- A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems 2015.
- B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2016.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2018.
- E. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV 2016.
- F. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV 2017.
- G. ASME B31.1 - Power Piping 2018.
- H. ASME B31.9 - Building Services Piping 2017.
- I. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications 2019.
- J. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2018.
- K. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2019.
- L. ASTM B32 - Standard Specification for Solder Metal 2008 (Reapproved 2014).
- M. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes 2020.
- N. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2020.
- O. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.
- P. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube 2016.
- Q. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings 2016.
- R. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings 2004 (Reapproved 2018).
- S. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2020a.

- T. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 2015, with Editorial Revision (2018).
- U. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter 2012a.
- V. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings 2019.
- W. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems 2012 (Reapproved 2018).
- X. ASTM D2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings 2014, with Editorial Revision (2018).
- Y. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings 2014.
- Z. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing 2014.
- AA. ASTM F628 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core 2012, with Editorial Revision (2018).
- BB. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).
- CC. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding 2011 (Amended 2012).
- DD. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems 2010.
- EE. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications 2017 (Revised 2018).
- FF. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications 2012 (Revised 2018).
- GG. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.
- HH. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010.
- II. NSF 61 - Drinking Water System Components - Health Effects 2019.
- JJ. NSF 372 - Drinking Water System Components - Lead Content 2016.

1.03 SUBMITTALS

- A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with State of California, standards.
- B. Maintain one copy on project site.
- C. Valves: Manufacturer's name and pressure rating marked on valve body.
- D. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- E. Welder Qualifications: Certified in accordance with ASME BPVC-IX.
- F. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.05 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with State of California plumbing code.
- B. Conform to applicable code for installation of backflow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. ABS Pipe: ASTM F628.
 - 1. Fittings: ABS.
 - 2. Joints: Solvent welded with ASTM D2235 cement.

2.03 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Copper Pipe: Class 150 bronze unions with brazed joints below grade, hard drawn, Type K, wrapped.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 - 2. Joints: ASTM B32, alloy Sn95 solder.

2.05 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, alloy Sn95 solder.

2.06 STORM WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. ABS Pipe: ASTM F628.
 - 1. Fittings: ABS.
 - 2. Joints: Solvent welded with ASTM D2235 cement.

2.07 STORM WATER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Neoprene gaskets and stainless-steel clamp-and-shield assemblies.

2.08 PROPANE GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
 - 2. Joints: Threaded or welded to ASME B31.1.
 - 3. All exposed piping shall be painted or jacketed.

2.09 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
 - 1. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Grooved and Shouldered Pipe End Couplings:
 - 1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
 - 2. Sealing gasket: "C" shape composition sealing gasket.

2.10 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 - 4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Drain, Waste, and Vent:
 - 1. Conform to ASME B31.9.
 - 2. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 - 4. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
 - 5. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
- C. Plumbing Piping - Water:
 - 1. Conform to ASME B31.9.
 - 2. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
 - 3. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 - 4. Hangers for Hot Pipe Sizes 2 Inches (50 mm) to 4 Inches (100 mm): Carbon steel, adjustable, clevis.

2.11 BALL VALVES

- A. Manufacturers:
 - 1. Tyco Flow Control: www.tycoflowcontrol.com.
 - 2. Apollo Valves: www.apollovalves.com.
 - 3. Stockham: www.stockham.com
- B. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder ends with union.

2.12 FLOW CONTROLS

- A. Manufacturers:
 - 1. Apollo Valves: www.apollovalves.com.

2.13 RELIEF VALVES

- A. Pressure:
 - 1. Manufacturers:
 - a. Cla-Val Co: www.cla-val.com/#sle.
 - b. Henry Technologies: www.henrytech.com/#sle.
 - c. Watts Regulator Company: www.wattsregulator.com/#sle.

2. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

2.14 STRAINERS

- A. Manufacturers:
 1. Armstrong International, Inc: www.armstronginternational.com/#sle.
 2. Green Country Filter Manufacturing: www.greencountryfilter.com/#sle.
 3. WEAMCO: www.weamco.com/#sle.
- B. Size 2 inch (50 mm) and Under:
 1. Threaded brass body for 175 psi (1200 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
 2. Class 150, threaded bronze body 300 psi (2070 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
- C. Size 1-1/2 inch (40 mm) to 4 inch (100 mm):
 1. Class 125, flanged iron body, Y pattern with 1/16 inch (1.6 mm) stainless steel perforated screen.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Shut-off valves shall be provided on all main branches, runs to risers and where shown on drawings. Locate shut-off valves over T-Bar Ceiling when possible. Provide access panesl when shut-off valves are located over hard lid ceilings.
- I. Provide access where valves and fittings are not exposed.
- J. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Color to be specified by architect.
- K. All exposed, unfinished pipe, fittings, supports, and accessories shall be painted.
- L. All piping, fittings, supports and accessories shall approved UV protection
- M. Install valves with stems upright or horizontal, not inverted. Refer to Section 22 05 23.
- N. Provide stem extension on all valves for piping requiring insulation to ensure valve can be cycled without damaging pipe insulation.
- O. Install water piping to ASME B31.9.

- P. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- Q. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as indicated.
 - 3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

3.04 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install globe valves for throttling, bypass, or manual flow control services.
- C. Provide spring loaded check valves on discharge of water pumps.

3.05 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect water distribution system in accordance with local jurisdiction. Potable water systems shall be disinfected and flushed prior to use by water-chlorination solution and have bacteriological examination made by an approved agency per 2019 California Plumbing Code section 609.9 and as prescribed in AWWA C651. Methods of cleaning / disinfecting for new or repair piping as described in C651 or NFPA 24.
- B. Prior to starting work, verify system is complete, flushed and clean.

3.06 INSTALLATION OF FLOW CONTROL VALVES

- A. Install automatic flow control valve in each hot water recirculating loop, and elsewhere as indicated. Install a shutoff valve and strainer upstream and a union, check valve and shutoff valve downstream of each automatic flow control valve.
- B. Set flow control valve flow rate as follows:
 - 1. Preliminary Procedures For Hot Water Return System Balancing:
 - a. Before operating the system perform these steps:
 - 1) Open Valves at recirculation pump and flow control valves to full open position.
 - 2) Remove and clean all strainers.
 - 3) Check recirculation pump rotation.
 - 4) Set water heater temperature as indicated on the drawings.
 - 2. Procedures For Hot Water Return System Balancing:
 - b. Refer to the drawings for required flow rate for each flow control valve.
 - c. Provide required instrumentation to obtain proper measurements. Instruments shall be properly maintained and protected against damage.
 - d. Apply instrument as recommended by the manufacturer.
 - e. Take readings with the eye at the level of the indicated valve to prevent parallax.
 - f. Mark flow control valve setting with memory stop. Mark with paint or other suitable, permanent identification materials.
 - g. Retest, adjust, and balance systems subsequent to significant systems modifications, and resubmit test results.
- C. Reports: Prepare hot water return system balancing reports signed and submit to the architect upon completion of the project. Include the following information:
 - 1. Valve tag number and description of location
 - 2. Valve body size
 - 3. Differential pressure reading from instrument in psi
 - 4. Actual flow rate derived from the manufacturer's charts and tablets for the valve size and measured differential pressure.

3.07 SERVICE CONNECTIONS

- A. See Civil plans for sewer service to the building. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. See Civil plans for water service to the building.

3.08 PIPE MATERIAL SCHEDULES - SEE PLUMBING SHEET P0.01.

END OF SECTION 22 1005

**SECTION 22 10 06
PLUMBING PIPING SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Drains.
- B. Cleanouts.
- C. Hose bibbs.
- D. Hydrants.
- E. Trap Primers.
- F. Mixing valves.

1.02 REFERENCE STANDARDS

- A. ASME A112.6.3 - Floor and Trench Drains 2019.
- B. ASME A112.6.4 - Roof, Deck, and Balcony Drains 2008 (Reaffirmed 2012).
- C. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers 2017.
- D. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent 2009.
- E. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers 2011.
- F. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance 2011 (Reaffirmed 2016).
- G. NSF 61 - Drinking Water System Components - Health Effects 2019.
- H. NSF 372 - Drinking Water System Components - Lead Content 2016.
- I. PDI-WH 201 - Water Hammer Arresters 2017.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Certificates: Certify that grease interceptors meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

- A. Manufacturers:
 - 1. Josam Company: www.josam.com.
 - 2. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Roof Drains:
 - 1. Assembly: ASME A112.6.4.
 - 2. Body: Lacquered cast iron with sump.

3. Strainer: Removable polyethylene dome with vandal proof screws.
- C. Roof Overflow Drains:
 1. Lacquered cast iron body and clamp collar and bottom clamp ring; pipe extended to 2 inches (51 mm) above flood elevation.
- D. Floor Drain:
 1. ASME A112.6.3; lacquered cast iron or stainless-steel, two-piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.
- E. Floor Sink:
 1. ASME A112.6.7; square top cast iron 12 inch deep medium receptor floor sink with acid resisting interior, double drainage flange with weepholes, bottom outlet aluminum internal dome strainer and cast iron non-traffic, acid resisting, anti-tilting, super-flo grate, with trap primer connection.

2.03 CLEANOUTS

- A. Manufacturers:
 1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
 2. Josam Company: www.josam.com.
 3. Zurn Industries, LLC: www.zurn.com.
 4. Mifab: www.mifab.com
- B. Cleanouts at Exterior Surfaced Areas (CO-1):
 1. Round cast nickel bronze access frame and non-skid cover.
- C. Cleanouts at Exterior Unsurfaced Areas (CO-2):
 1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.
- D. Cleanouts at Interior Finished Floor Areas (CO-3):
 1. Galvanized cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.
- E. Cleanouts at Interior Finished Wall Areas (CO-4):
 1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.04 HOSE BIBBS

- A. Manufacturers:
 1. Woodford: www.woodfordmfg.com.
 2. Zurn Industries, LLC: www.zurn.com.
 3. Mifab: www.mifab.com
- B. Interior & Exterior Hose Bibbs (HB-1):
 1. ASSE 1019; freeze resistant, self-draining type with chrome plated wall plate hose thread spout, lockshield and removable key, and integral vacuum breaker. Faucet to be housed in a flush mounted, tamper resistant brass wall box.

2.05 HYDRANTS

- A. Manufacturers:
 1. Zurn Industries, LLC: www.zurn.com.
 2. Woodford: www.woodfordmfg.com.
- B. Roof (HB-2):
 1. ASSE 1019: Roof hydrant, freeze resistant, brass head casting, adjustable packing nut brass nut with deep stem guard, standard O size seat washer, hose connection with backflow preventer, powder coated metal wheel handle and mounting support.

2.06 TRAP PRIMERS

- A. Manufacturers:
 - 1. Jay R. Smith Manufacturing Company: www.jayrsmith.com/#sle.
 - 2. Josam Company: www.josam.com/#sle.
 - 3. Zurn Industries, LLC: www.zurn.com/#sle.
 - 4. Mifab: www.mifab.com
- B. Trap Primers:
 - 1. TP-1: Pressure drop activated trap primer: brass trap seal primer complete with four view hole and removable filter screen. Requires no air pre-charge. Operating range is 20 to 125 p.s.i. IAPMO and CCSA listed. ASSE standard 1018 tested and certified.
 - 2. TP-2: Electronic Trap - Stainless steel solenoid valve, air gap, copper manifold and battery pack controller. Serves 5 drains. Manufactured in accordance with ANSI/ASME A112.1.2 air gap in plumbing systems standard. UA 18x18 access door is suggested for access.

2.07 MIXING VALVES

- A. Thermostatic Mixing Valves:
 - 1. Manufacturers:
 - a. ESBE: www.esbe.se/en.
 - b. Honeywell International Inc: www.honeywellhome.com.
 - c. Leonard Valve Company: www.leonardvalve.com.
 - 2. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.
 - 3. Cabinet: 16 gage, 0.0598 inch (1.52 mm) prime coated steel, for recessed mounting with keyed lock.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- F. Pipe relief from backflow preventer to nearest drain.
- G. Install trap primers where floor drains are installed.

END OF SECTION 22 1006

**SECTION 22 3000
PLUMBING EQUIPMENT**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water Heaters:
 - 1. Commercial electric.
- B. Diaphragm-type compression tanks.
- C. In-line circulator pumps.

1.02 REFERENCE STANDARDS

- A. ANSI Z21.10.3 - Gas-Fired Water Heaters - Volume III - Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous 2015.
- B. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels 2019.
- C. CSA P.3 - Testing Method for Measuring Energy Consumption and Determining Efficiencies of Gas-Fired Storage Water Heaters 2015, with Errata (2017).
- D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 778 - Standard for Motor-Operated Water Pumps Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. Product Data:
 - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
 - 2. Indicate pump type, capacity, power requirements.
 - 3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
 - 4. Provide electrical characteristics and connection requirements.
- B. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.06 WARRANTY

- A. Provide three year manufacturer warranty for water storage tanks.

PART 2 PRODUCTS

2.01 WATER HEATERS

- A. Manufacturers:
 - 1. A.O. Smith: www.AOSMITH.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Commercial Electric:
 - 1. Type: Factory-assembled and wired, electric, vertical storage.
 - 2. Tank: Glass lined welded steel; 4 inch (100 mm) diameter inspection port, thermally insulated with minimum 2 inches (50 mm) glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.

3. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F (16 to 82 degrees C), flanged or screw-in nichrome elements, high temperature limit thermostat.
4. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 W/sq in (11.6 W/sq m).

2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

- A. Manufacturers:
 1. Amtrol Inc: www.amtrol.com/#sle.
 2. Bell & Gossett, a xylem brand: www.bellgossett.com/#sle.
 3. Taco, Inc: www.taco-hvac.com/#sle.
- B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig (860 kPa), with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.
- C. Accessories: Pressure gauge and air-charging fitting, tank drain; pre-charge to 12 psig (80 kPa).

2.03 IN-LINE CIRCULATOR PUMPS

- A. Manufacturers:
 1. Armstrong Fluid Technology: www.armstrongfluidtechnology.com/#sle.
 2. Bell & Gossett, a xylem brand: www.bellgossett.com/#sle.
 3. Taco Pumps: www.taco-hvac.com.
- B. Casing: Bronze, rated for 125 psig (860 kPa) working pressure, with stainless steel rotor assembly.
- C. Impeller: Bronze.
- D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- E. Seal: Carbon rotating against a stationary ceramic seat.
- F. Drive: Flexible couplings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and related electrical work to achieve operating system.
- C. Pumps:
 1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

3.02 SCHEDULES - SEE SHEET P0.02.

END OF SECTION 22 3000

**SECTION 22 4000
PLUMBING FIXTURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sinks.
- B. Service sinks.
- C. Under-lavatory pipe supply covers.
- D. Drinking fountains.
- E. Water Closets
- F. Urinals
- G. Showers
- H. Floor Drains
- I. Floor Sinks
- J. Washing Machine Box

1.02 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011 (Reaffirmed 2017).
- C. ANSI Z124.2 - American National Standard for Plastic Shower Units; 1995.
- D. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use 1997 (Reaffirmed 2017).
- E. ASME A112.18.1 - Plumbing Supply Fittings 2018, with Errata.
- F. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures; The American Society of Mechanical Engineers; 2008 (R2011).
- G. ASME A112.19.2 - Ceramic Plumbing Fixtures 2018.
- H. ASME A112.19.3 - Stainless Steel Plumbing Fixtures 2017.
- I. ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers 2005.
- J. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices 2015.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- L. NSF 61 - Drinking Water System Components - Health Effects 2019.
- M. NSF 372 - Drinking Water System Components - Lead Content 2016.

1.03 SUBMITTALS

- A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- B. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.

- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.06 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.
- B. Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply to CBC Section 11B-213.2 shall comply with CBC Section 11B-213.3.
- C. Accessible plumbing fixtures shall comply with all the requirements in CBC Division 6.
- D. Clearance around accessible water closets and 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 11B-604.3.1.
- E. Heights and location of all accessible fixtures shall be mounted according to CBC Section 11B-602 through 11B-612.
- F. 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 and sinks. CBC Section 11B-606.5.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 WATER CLOSET: VITREOUS CHINA, WALL MOUNTED DUAL FLUSH SIPHON JET BOWL DESIGN.

- A. Water Closet Flush Valves: Sloan
- B. Water Closet Seats: Church, Olsonite, Bemis, and Kohler for closet seats, or approved
- C. Water Closet Manufacturer: Kohler, American Standard, Crane, Zurn, and Acorn

2.03 URINALS: VITREOUS CHINA, WALL HUNG WITH FLUSH VALVE.

- A. Urinal Flush Valves: Sloan
- B. Urinal Manufacturer: Kohler, American Standard, Crane, Zurn, and Acorn for fixtures or approved.
- C. Waterless urinals are not allowed.

2.04 LAVATORIES: VITREOUS CHINA, WITH METERING FAUCET.

- A. Faucet: American Standard or Chicago Faucets.
- B. Lavatory Manufacturer: Kohler, American Standard, Crane, Acorn, Bradley, Zurn.

2.05 SINKS

- A. Sink Manufacturers:
 - 1. Kohler www.kohler.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Single Compartment Bowl (KS-1):
 - 1. ASME A112.19.3: 25"x22"x9" single bowl drop in classroom sink, 18 gage thick, Type 304 stainless steel, rear center drain placement, and bottom only pads.
 - a. Drain: 3-1/2" drain.
- C. Accessories: Chrome plated 17 gage (1.3 mm) brass P-trap with clean-out plug and arm with escutcheon, wheel handle stop, rigid supplies.

2.06 UNDER-LAVATORY PIPE SUPPLY COVERS

- A. Manufacturers:
 - 1. Plumberex Specialty Products, Inc: www.plumberex.com.

2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. General:
 1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
 2. Construction: 1/8 inch (3.2 mm) PVC with antimicrobial, antifungal and UV resistant properties.
 - a. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
 3. Color: High gloss white.
 4. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.

2.07 SERVICE SINKS

- A. Service Sink Manufacturers:
 1. Fiat Products: www.fiatproducts.com.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Bowl: ASME A112.19.1; 24 by 24 by 12 inch deep, one piece terrazzo made of black and white marble chips in gray portland cement, floor mounted. Shoulders shall be not less than 12 inch outside and 10 inch inside. Standard drain body to be stainless steel cast integrally, stainless steel strainer.
- C. Accessories:
 1. Hose clamp hanger.
 2. Mop hanger.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of countertop lavatories and sinks.

3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key or integral stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall carriers and bolts.
- E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures, valves, cleanouts and openings before rough-in and installation.

3.05 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

- A. Clean plumbing fixtures and equipment.

3.07 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

3.08 SCHEDULES

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated on plumbing drawing P0.02 to meet ADA standards.
- B. Fixture Rough-In - See sheet P0.02.

END OF SECTION 22 4000

**SECTION 23 00 10
BASIC MECHANICAL REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Basic Mechanical Requirements specifically applicable to Division 23 Sections, in addition to Division 01 - General Requirements.

1.02 DESCRIPTION

- A. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as required to complete the work of this section, except as otherwise herein specifically excluded.

1.02 WORK INCLUDED

- A. The complete Heating, Ventilating and Air Conditioning (HVAC) systems, including but not limited to these major items.
 - 1. Coordinate work of this Section with related trades.
 - 2. Verify applicable dimensions and locations of existing utilities, fans, and thermostats at the jobsite.
 - 3. Duct systems: supply, return and exhaust complete with combination fire-smoke dampers, manual dampers.
 - 4. Diffusers, grilles, and registers.
 - 5. Intake and relief ventilators.
 - 6. Exhaust fans.
 - 7. Ducted split units.
 - 8. Ductless split units.
 - 9. Refrigerant piping and accessories.
 - 10. Controls
 - 11. Furnishing and installation of miscellaneous hangers, supports, sleeves, inserts, anchors and other auxiliary equipment for systems under this Division.
 - 12. Duct lining and insulation.
 - 13. Piping insulation.
 - 14. Shop drawings.
 - 15. Equipment identification.
 - 16. Equipment and systems adjustments and balancing.
 - 17. Air testing, adjusting, and balancing.
 - 18. Written operating and maintenance instructions.
 - 19. Record drawings.
 - 20. Guarantee

1.03 WORK SPECIFIED ELSEWHERE

- A. Concrete, Rough Carpentry, Joint Sealants, Sheet Metal, Flashing and Trim, Access Door and Frames, Acoustical Ceiling Tile, Door Hardware, Paints and Coatings, Plumbing and Electrical.

1.04 SITE INSPECTION

- A. Contractor shall familiarize himself with the conditions at the site. No allowance will be made subsequently for any error through negligence in observing the site conditions. Contractor shall observe and make cost allowance for any mechanical and/or electrical items that must be relocated to accommodate the installation or servicing of any item covered under this contract.

1.05 ORDINANCES, REGULATIONS AND CODES

- A. References to Technical Societies, Trade Organizations, Governmental Agencies is made in Division 15 in accordance with the following abbreviations.
 - 1. AFI - Air Filter Institute
 - 2. AMCA - Air Moving & Conditioning Association
 - 3. ARI - Air Conditioning & Refrigeration Institute

4. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
 5. ASME - American Society of Mechanical Engineers
 6. ASTM - American Society of Testing Materials
 7. AWS - American Welding Society Code
 8. ANSI - American National Standards Institute
 9. CBC - California Building Code
 10. CCR - California Code of Regulations
 11. CEC - California Electrical Code
 12. CFC - California Fire Codes
 13. CMC - California Mechanical Code
 14. CPC - California Plumbing Code
 15. FIA - Factory Insurance Association
 16. NAFM - National Association of Fan Manufacturers
 17. NEMA - National Electrical Manufacturer's Association
 18. NFPA - National Fire Protection Association
 19. ORS - Office of Regulatory Services
 20. SCAQMD - South Coast Air Quality Management District
 21. SMACNA - Sheet Metal and Air Conditioning Contractors National Association
 22. UL - Underwriter's Laboratories
- B. Requirements of Regulatory Agencies: Materials and installation shall comply with applicable state codes. Rulings and interpretations of the enforcing agencies shall be considered as part of the local codes. No extras will be permitted for furnishing items required by the local codes but not specified or shown on the drawings.
- C. Codes and Standards:
1. IBC and California Amendments (California Building Code - Part 2, Title 24, CCR).
 2. UMC and California Amendments (California Mechanical Code - Part 4, Title 24 CCR).
 3. UPC and California Amendments (California Plumbing Code - Part 5, Title 24 CCR).
 4. International Fire Code with State Amendments (California Fire Code - Part 9, Title 24 CCR).
 5. National Fire Protection Associations.
- D. Nothing in these drawings and specifications is to be construed to permit work in violation thereof. Ordinances, regulations and codes are to be construed as minimum requirements.
- E. The responsibility of the Architect to conduct construction reviews of the Contractor's performance is not intended to include the adequacy of the Contractor's safety measures in, on, or near the construction site.
- F. Ventilating, refrigeration and electrical equipment and appliances are required to be approved by the Underwriters' Laboratories, Inc., or other nationally recognized testing agency and installed per the testing agency's specifications.

1.06 PERMITS, FEES AND INSPECTIONS

- A. Obtain and pay for all necessary permits, fees, assessments, complimentary drawings, required by any legally constituted public authorities having jurisdiction.

1.07 DRAWINGS AND SPECIFICATIONS

- A. The Architect's decision will be final on interpretation of the Drawings and Specifications.
- B. The Drawings and Specifications are complimentary. Any work called for on the Drawings and not mentioned in the Specifications, or vice versa, shall be performed as though fully set forth in both.
- C. Piping, ductwork and other equipment shown as existing has been taken from the Owner's drawings. Contractor shall verify exact location in field before proceeding with the work.
- D. Where codes, standards, drawings or specifications conflict, the most stringent shall prevail, unless prior approval for variance is obtained. Specific details on the drawings shall supersede the specification in the event of a conflict.

- E. Alternate support or seismic detail proposed by contractor shall have prior approval by the Architect; and the Contractor shall obtain agency approval without any additional cost or time to the contract and without any time penalty on the work schedule.

1.08 SUBMITTALS

- A. Before starting work, the Contractor shall furnish for the approval of the Architect, Shop Drawings and Submittals with Itemized Equipment Lists, complete in all details that they propose to install. All items shall be submitted at the same time.
- B. Submittals must be specific to this project with respect to model number, capacities, performance, etc., generic submittals will not be accepted.
- C. Variations or deviations on submitted items from that specified must be clearly tagged and / or identified
- D. Submittals shall include, but not necessarily be limited to the following which are mandatory:
 - 1. Draw Equipment Layouts to 1/4" scale, including equipment, ductwork and accessories, and showing clearances for operating and servicing.
 - 2. Earthquake supports and calculations.
 - 3. Insulation.
 - 4. Ventilation and air conditioning equipment, specialties and the air control systems.
 - 5. Fans, fan characteristic curves, fan tests.
 - 6. Dampers, grilles, registers, diffusers.
 - 7. Shop fabrication drawings and installation drawings of ductwork layouts. Submit for approval prior to fabrication. Drawings shall indicate dimensions from bottom of ductwork to finish floor level.
 - 8. Wiring diagrams, control panel board, motor starters and controls for electrically operated equipment furnished by mechanical trades.
 - 9. Automatic control systems diagrams.
 - 10. Exhaust fans.
 - 11. Access panels.
 - 12. Hangers, inserts, supports, anchors.
 - 13. Pipe, fittings and specialties.
 - 14. Sleeves, escutcheons, caulking, waterproofing, fireproofing.
 - 15. Shop fabrications drawings and calculations.
 - 16. Special and miscellaneous products furnished under this section and not listed herein.

1.09 RECORD DRAWINGS AND MANUALS

- A. Record Set During the Work: At site, maintain at least one set of Drawings as a Field Record Set. Also maintain at least one copy of all Addenda, Modifications, approved submittals, correspondence, and transmittals at site. Keep Drawings and data in good order and readily available to Architect and Owner.
- B. Changes: Clearly and correctly mark Record Drawings to show changes made during the construction process at the time the changed work is installed. No such changes shall be made in the work unless authorized by the Architect.
- C. Final Record Drawings: Conform to Division 01 requirements.
- D. Preparation of Final Record Drawings: Contractor shall transfer recorded changes in the work indicated on the Field Record Set to the record set. Changes shall be neatly and clearly drawn and noted by skilled draftsmen and shown technically correct.
- E. Approval: Prior to Architect's inspection for Substantial Completion, submit the Final Record Drawings to the Architect for review, and make such revisions as may be necessary for Final Record Drawings to be a true, complete, and accurate record of the work.
- F. Manuals: Obtain data from the various manufacturers and submit instruction, operation, and maintenance manuals as required and to the extent required under other Sections.
- G. Contents: Each manual shall have an index listing the contents. Information in the manuals shall include not less than:

1. General introductions and overall equipment description, purpose, functions and simplified theory of operation.
 2. Specifications
 3. Installation instructions, procedures, sequences, and precautions, including tolerances for level, horizontal and vertical alignment.
 4. Grouting requirements.
 5. List showing lubricants for each item of mechanical equipment and recommended lubrication intervals.
 6. Start-up and beginning operation procedures.
 7. Operational procedures.
 8. Shutdown procedures.
 9. Maintenance and calibration procedures
 10. Parts lists
 11. Name, address and telephone number of each manufacturer's local representative.
- H. Manual Submittals: Unless otherwise specified, each submittal shall include two copies of each manual, one of which will be returned to the Contractor, marked to show the required review. When approved, deliver four copies to Architect unless otherwise specified.
- I. "As-Built" drawings of ductwork and piping, including all elbows, transitions, damper and valve locations shall be provided prior to commencement of air and water balance.

1.10 QUALITY OF EQUIPMENT, MATERIALS AND WORKMANSHIP

- A. Unless otherwise specified, equipment and materials used in the installation shall be new and in perfect condition when installed. Articles provided for the same general purpose or use shall be of the same make. Workmanship shall be of the best quality and none but competent mechanics skilled in their trades shall be employed. Furnish the services of an experienced superintendent, who shall be constantly in charge of the work, together with all necessary journeymen, helpers and laborers required.

1.11 SEISMIC DESIGN

- A. Contractor shall be responsible for anchors and connections of mechanical work to the building structure including calculations for approval by structural engineer or for approval by inspector of record, as applies, for items or work, where approval is deferred or where alternate support or anchorage detail is proposed to prevent damage as a result of an earthquake, including manufactured equipment, the connection and integrity of shop fabricated and field fabricated materials and equipment. The anchorage of all pipes, ducts, conduits, fixtures, equipment, etc. shall withstand the lateral forces and shall accommodate calculated building displacement as required by the California Building Code, and local city/county codes. (Building equipment and connections therefore shall be designed to resist lateral seismic forces equal to 1.0 of equipment weight to working allowable stress. Cantilever posts supporting equipment shall be designed to resist lateral seismic forces equal to 0.5 of equipment weight to allowable working stress. Conform to the following:
1. In accordance with Title 24, 2019 CBC Chapter 16A, details shall be provided for the seismic anchorage of all mechanical and electrical equipment, anchorage details shall be based upon appropriate design calculations.
 2. For equipment weighing 400 pounds or more anchorage details and appropriate design calculations shall be submitted as part of the mechanical and electrical drawings. "Deferred Approval" items will not be permitted unless specifically approved by the plan check supervisor.
 - a. Exception: Attachments of equipment weighing less than 400 pounds and supported directly on the floor or roof structure, furniture, or temporary or movable equipment and equipment weighing less than 20 pounds that is supported by vibration isolation devices suspended from the roof, wall or floor, need not be detailed on the plans provided the following notes are included on the mechanical and electrical plans.

3. The seismic anchorage of mechanical and electrical equipment shall conform to C.C.R. Title 24, 2019 CBC Chapter 16A. Anchorage details for roof/floor-mounted equipment shall be shown on plans.

1.12 SUBSTITUTIONS AND CHANGES

- A. The design has been based on data from certain manufacturers, suitable for each application. Recommendations for alternative manufacturers are made for each product, except when "no substitutions permitted" is indicated.
- B. It is the intent of the Owner to have this project constructed with materials, products and system originally designed and specified into the project.
- C. Alternatives that may require the modification, realignment and/or adjustment of other associated components, including impact on other trades, shall be accomplished at no additional cost or time to the contract and shall have the approval of the Architect.
- D. Substitutions shall be submitted addressing all features listed in the specifications. Features that deviate from the plans and specifications shall be clearly identified including justification for deviations. Design West Engineers will review initial submittal on substitutes only. Subsequent submittals made to correct deficiencies in original submittals will be reviewed at Contractor's expense based on Design West Engineer's hourly rate for engineering services.
- E. Should the Contractor elect to propose substitutions for the Owner's interest, the substitutions shall be in compliance with Division 01.

1.13 SUBMITTAL REVIEWS

- A. The Architect will have the right to accept or reject equipment, materials, workmanship, tests and determine when the Contractor has complied with the requirements herein specified.

1.14 SELECTION AND ORDERING OF EQUIPMENT AND MATERIALS

- A. Immediately after award of the Contract and after the final review of submittals by the Architect and / or Engineer, the Contractor shall arrange for the purchase and delivery of equipment and materials required, in ample quantities and at the proper time to meet the construction schedule. The contractor shall deliver to the Architect and Owner a complete list of equipment and materials ordered, giving descriptions, plate numbers, brochures, name of the wholesalers, date of the orders and approximate delivery dates.

1.15 LOCATIONS AND ACCESSIBILITY

- A. Drawings show pipe and ductwork diagrammatically. Conform to Drawings as closely as possible in layout work. Vary run of piping, run and shape of ductwork and make offsets during progress of work as required to meet structural and other interferences as reviewed by Architect and / or Engineer. Install piping and ductwork to best suit field conditions after coordinating with other trades. Run exposed piping and ductwork parallel to, or at right angle to, building walls. Keep horizontal lines as close to bottom of structures as possible. Conform to ceiling heights established on Drawings.
- B. Install equipment in such a manner as to be readily accessible for maintenance and repairs. Install piping, ducts and conduit in such a manner as to preserve headroom, avoid obstructions and keep openings and passageways clear.
- C. Installation at valves, thermometers, gauges, cleanouts, dampers, controls, duct access doors or any other indicating equipment or specialties requiring reading, adjustment, inspection, maintenance shall be conveniently and accessible located with reference to the finished building.
- D. Where wall and ceiling access doors are required but not shown, such doors shall be furnished under other sections and as directed by the Architect. Coordinate this requirement with appropriate trade.
- E. If changes in the indicated locations or arrangements are required, they shall be made without additional charges.

- F. In an existing area, where required, remove, reinstall, reconnect or replace, etc., any existing work to accommodate new work without any additional cost to the Owner. Material shall match existing, unless otherwise specified or approved in writing by the Architect.
- G. Provide sheaves and belts if required, to Test, Adjust and Balance Agency, to allow air moving equipment to meet flow requirements specified at no additional cost to the Owner.

1.16 COORDINATION OF TRADES

- A. Contractor shall coordinate all trades in the interest of obtaining the most practical overall arrangement of equipment, piping, conduit, and ducts and to maintain maximum headroom and accessibility.
- B. No extras will be allowed for changes made necessary by interference or coordination between trades.
- C. Submit Composite Coordination Drawings in accordance with Submittal Procedures. Include dimensioned plans, elevations, sections and details and give complete information particularly as to the kinds and types of materials and equipment, size and location of sleeves, inserts, attachments, chases, openings, conduits, ducts, boxes, lighting, structural interferences. Coordinate these Composite Coordination Drawings and field layouts in the field for proper relationship to work of applicable trades based on field conditions. Contractor shall have competent personnel readily available for coordinating, checking, and supervision of field layouts. The procedures for submittals and resubmittals, and final distribution shall be as specified in Division 01. Do not start installation of work involved under Composite Coordination Drawings until the Architect reviews applicable submittal. Discrepancies between the Drawings and Composite Coordination Drawings shall be specifically noted and identified on the Composite Coordination Drawings. Drawings for the various trades involved shall be submitted as required and reviewed prior to preparation of Composite Coordination Drawings.
 - 1. Equipment Foundations and Bases: Furnish certified details and drawings for approval before fabrication. Furnish parts necessary for each foundation sub base and support.
 - 2. Roof, Wall and Floor Openings: Furnish Shop Drawings showing exact locations and sizes of openings through roofs, walls and floors.

1.17 GUARANTEES

- A. Contractor shall guarantee workmanship, equipment and materials installed under his contract for a period of not less than one (1) year from the date of Substantial Completion. Should any defects occur during this period, the Contractor shall promptly repair or replace the defective item and any other damage caused to the building free of charge to the Owner, including cost of labor and materials.
- B. Guarantee included in this section to cover:
 - 1. Faulty or inadequate design of equipment or material installed
 - 2. Improper assembly or erection
 - 3. Defective workmanship or material
 - 4. Incorrect or inadequate operation or other failure
- C. The contractor shall guarantee the complete and perfect operation of the entire system and that equipment will be supported in such a way as to be free of objectionable vibration and noise
- D. Furnish the parts and labor to replace any items found to be defective in the mechanical equipment with the guarantee period.
- E. In addition to other guarantees, furnish free maintenance for the refrigeration equipment, including replacement of refrigerant and oil, for a period of one (1) year. This shall include regular monthly maintenance and "On Call" service if required.
- F. For equipment bearing a manufacturer's warranty in excess of one year, furnish a copy of the warranty and proof of shipment date or purchase date per terms of warranty to the Owner, who shall be named as beneficiary.

1.18 PROTECTION OF EQUIPMENT AND MATERIALS

- A. Provide adequate storage facilities for equipment and materials on the site and shall make provisions to protect such materials and equipment from damage.

1.19 CLOSING-IN OF UNINSPECTED WORK

- A. Contractor shall not allow or cause any of the work, specifically ductwork and piping, to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Should any of work be covered up or enclosed before such inspection and test, he shall at his own expense, uncover the work and after it has been inspected, tested, and approved, make repairs with such materials as may be necessary to restore work to its original and proper condition.

1.20 BUILDING FOOTING CLEARANCES

- A. Under no circumstances shall pipes, ducts, or conduits penetrate footings. They shall cross below footings or through sleeves above footings. Those running parallel to footings shall have the minimum clearance from the cone of influence indicated on the Drawings or as required by Code.

1.21 DAMAGE BY LEAKS

- A. Contractor shall be responsible for all damage to any part of the premises caused by rain leaks through or around ducts or pipes, leaks or breaks in piping, equipment or fixtures furnished or installed by him for a period of one (1) year from the date of Substantial Completion.

1.22 EQUIPMENT LABELS

- A. Equipment provided under this Section shall be provided with the manufacturer's metal identification labels attached to each individual piece of equipment showing complete performance characteristics, size, model and serial number.

1.23 PRELIMINARY OPERATION

- A. Should the Owner request that any portion of the plant, apparatus, or equipment be operated for the Owner's beneficial use prior to the final completion and acceptance of the work, the Contractor shall conform to Beneficial Occupancy Provisions of the General Conditions. Such operation shall be under the supervision and direction of the Contractor. Such preliminary operation shall not be construed as an acceptance of any of the work.

1.24 MAINTAINING EXISTING SERVICES

- The premises and existing building at the site will be in use at the time the work of this Section is in progress. Contractor shall conduct his work so as to cause no inconvenience or danger to the personnel on the premises.
- B. He shall maintain continuity of service to the existing mechanical systems, except for designated intervals during which connections can be made. The scheduling of the shutdown period shall be at a time directed by the Architect.
 - C. In some instances, it may be necessary to defer work in certain areas and locations until such time as existing facilities can be relocated or rearranged by the Owner. Therefore, whenever it becomes necessary for the Contractor to perform work under this contract in areas in which the Owner's work is being performed. This contractor shall advise the Architect relative to this requirement and shall follow closely the directive issued by the Architect insofar as time and procedure are concerned. Allow Owner 72 hours prior notice.
 - D. This contractor shall include in his bid all premium time to which he may be subjected for performing work in such procedure and at such time as may be necessary to cause the least interference with the function of the Owner.

1.25 ELECTRICAL WORK

- A. Coordinate with Division 26 in making the line and low voltage electrical connections and be responsible for the operation of the equipment furnished under this section.

- B. Voltage for electrical work will be included in Division 26. However, any control wiring which is required that is not shown on the control diagram shall be as described under this Section. In the event that the Contractor chooses to provide equipment that requires extra expense in the power or control wiring, he shall pay additional electrical costs.
- C. Safety switches, starters, circuit breakers, unless provided as a portion of package equipment, and the electrical connections of mechanical equipment to the electrical power service shall be provided under Division 26.
- D. Interconnecting wiring, safety switches, relays, controllers and motor starters which are integral components of packaged equipment shall be provided as an integral part of that equipment.
- E. All interconnecting power wiring and conduits shall be provided by Division 26.
- F. Control wiring shall be provided by Division 23, unless otherwise indicated on the drawings.
- G. Conduit for control wiring shall be provided by Division 26.

END OF SECTION 23 0010

**SECTION 23 0529
HANGERS AND SUPPORTS**

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes the following hangers and supports for mechanical system piping and equipment:
 - 1. Steel 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 include the following:
 - 1. Division 05 for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
 - 2. Division 23 Section "Mechanical Vibration and Seismic Controls" for vibration isolation devices.
 - 3. Division 23 Section "Pipe Expansion Fittings and Loops" for flexible pipe..
 - 4. Division 23 Section "Metal Ducts" for duct hangers and supports.

1.02 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.03 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.04 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel pipe hangers and supports.
 - 2. Thermal-hanger shield inserts.
 - 3. Powder-actuated fastener systems. Not allowed for this project.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze pipe hangers. Include Product Data for components.
 - 2. Metal framing systems. Include Product Data for components.
 - 3. Pipe stands. Include Product Data for components.
 - 4. Equipment supports.
- C. Welding and brazing certificates.

1.05 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel." ASME Boiler and Pressure Vessel Code: Section IX.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."

2. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.02 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.
- C. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- D. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.03 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.04 METAL FRAMING SYSTEMS

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
- C. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.05 THERMAL-HANGER SHIELD INSERTS

- D. Description: 100-psig-minimum, compressive-strength insulation insert encased in sheet metal shield.
- E. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.
- F. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.
- G. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- H. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- I. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

3.02 FASTENER SYSTEMS

- A. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 - 1. Before Installation: Verify suitability for use in lightweight concrete or concrete slabs less than 4 inches thick with project structural engineer.

3.03 PIPE STAND FABRICATION

- A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
 - 2. Submit: Calculations and details of each pipe stand unit.
 - 3. Available Manufacturer: MIRO Industries.

- 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 stainless-steel base unit with plastic roller, for roof installation without membrane penetration.
- D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
 - 4. Base: Stainless steel.
 - 5. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
 - 6. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.
- E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
 - 7. Available Manufacturer: Portable Pipe Hangers.
 - 8. Bases: One or more plastic.
 - 9. Vertical Members: Two or more protective-coated-steel channels.
 - 10. Horizontal Member: Protective-coated-steel channel.
 - 11. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.
- F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

3.04 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

3.05 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
 - 12. Properties: Non-staining, non-corrosive, and nongaseous.
 - 13. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 EXECUTION

3.06 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified 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 padded hangers for bare piping for noise abatement.
- F. Piping shall be concealed in chases, partitions, walls, and between floors, unless otherwise directed or specifically noted on Drawings. When penetrating wood studs, joists, and other wood members, provide such members with reinforcement steel straps of Kees Protecta-Plate.
- G. For fastening to wood ceilings, beams, or joists, furnish Grinnell figure 128 or 202 pipe hanger flange fastened with drive screws. Under wood floors, 3/8 inch hanger rods shall be hung from 2 inch x 2 inch x 1/4 inch angle clips 3 inches long, with 2 staggered 10d nails, clinched over joist.

- H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 14. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes.
 - 15. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 and larger, requiring up to 4 inches of insulation.
 - 16. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, requiring clamp flexibility and up to 4 inches of insulation.
 - 17. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, if little or no insulation is required.
 - 18. 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.
 - 19. Adjustable Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of non-insulated stationary pipes, NPS 3/4 to NPS 8.
 - 20. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8.
 - 21. Adjustable Band Hangers (MSS Type 9): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8.
 - 22. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 2.
 - 23. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of non-insulated stationary pipes, NPS 3/8 to NPS 8.
 - 24. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of non-insulated stationary pipes, NPS 3/8 to NPS 3.
 - 25. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 and larger.
 - 26. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 - 27. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 and larger, with steel pipe base stanchion support and cast-iron floor flange.
 - 28. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 and larger, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
 - 29. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
- I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 30. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers.
 - 31. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, if longer ends are required for riser clamps.
- J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 32. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 - 33. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 - 34. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 - 35. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 - 36. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 37. 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.

- 38. Side-Beam Brackets (MSS Type 34): For sides of wooden beams.
- L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 39. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 - 40. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 - 41. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- M. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- N. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- O. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.07 HANGER AND SUPPORT INSTALLATION

- A. Steel 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 building structure.
- B. 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.
 - 42. Each trapeze pipe hanger requires submittal of calculations and details.
 - 43. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
 - 44. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
 - 45. Each metal framing system requires submittal of calculations and details.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
 - 46. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Pipe Stand Installation:
 - 47. Each pipe stand in requires submittal of calculations and details.
 - 48. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
 - 49. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 for curbs specifications.
- G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
 - 50. Each equipment support requires submittal of calculations and details.
- I. 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.
- J. Install lateral bracing with pipe hangers and supports to prevent swaying.
- K. Install building attachments. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping.

- L. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- N. Insulated Piping: Comply with the following:
 - 51. Attach clamps and spacers to piping.
 - d. a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - e. b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - f. c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
 - 52. 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.
 - 53. 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.
 - 54. 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.
 - 55. Pipes NPS 8 and Larger: Include wood inserts.
 - 56. Insert Material: Length at least as long as protective shield.
 - 57. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.08 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 smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.09 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 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
 - 58. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 59. Obtain fusion without undercut or overlap.
 - 60. Remove welding flux immediately.
 - 61. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.10 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.

3.11 PAINTING

- A. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 23 0529

SECTION 23 0553

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe markers.
- D. Ceiling tacks.

1.02 RELATED REQUIREMENTS

- A. Section 09 91 23 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Air Handling Units, Exhaust Fans: Nameplates.
- B. Dampers: Ceiling tacks, where located above lay-in ceiling.
- C. Major Control Components: Nameplates.
- D. Piping: Pipe markers.
- E. Relays: Tags.
- F. Thermostats: Nameplates.

2.02 NAMEPLATES

- A. Manufacturers:
 - 1. Advanced Graphic Engraving, LLC: www.advancedgraphicengraving.com/#sle.
 - 2. Brimar Industries, Inc: www.pipemarker.com/#sle.
 - 3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
- B. Letter Color: White.
- C. Letter Height: 1/4 inch.
- D. Background Color: Black.
- E. Plastic: Comply with ASTM D709.

2.03 TAGS

- A. Manufacturers:
 - 1. Advanced Graphic Engraving: www.advancedgraphicengraving.com/#sle.
 - 2. Brady Corporation: www.bradycorp.com/#sle.
 - 3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.04 PIPE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradycorp.com/#sle.
 - 2. Brimar Industries, Inc: www.pipemarker.com/#sle.
 - 3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
- B. Color: Comply with ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.05 CEILING TACKS

- A. Manufacturers:
 - 1. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: Steel with 3/4 inch diameter color coded head.
- C. Color code as follows:
 - 1. HVAC Equipment: Yellow.
 - 2. Fire Dampers and Smoke Dampers: Red.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 91 23 for stencil painting.

3.02 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Use tags on piping 3/4 inch diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.
 - 3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- F. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 26 0553

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems 2008 (Reaffirmed 2017).
- C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing 2002.

1.03 SUBMITTALS

- A. The contractor shall procure the services of an independent Air Balance and Testing Agency, approved by the Engineer, which specializes in the balancing and testing of heating, ventilating, and air conditioning systems. The independent agency shall be certified and in good standing with the AABC.
- B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - 1. Submit to Architect.
 - 2. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with Architect and other installers to sufficiently understand the design intent for each system.
 - 3. Include at least the following in the plan:
 - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - c. Identification and types of measurement instruments to be used and their most recent calibration date.
 - d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - e. Final test report forms to be used.
 - f. Expected problems and solutions, etc.
 - g. Criteria for using air flow straighteners or relocating flow stations and sensors.
 - h. Details of how TOTAL flow will be determined; for example:
 - 1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
 - i. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.
 - j. Confirmation of understanding of the outside air ventilation criteria under all conditions.
 - k. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
 - l. Method of checking building static and exhaust fan and/or relief damper capacity.

- m. Time schedule for deferred or seasonal TAB work, if specified.
 - n. False loading of systems to complete TAB work, if specified.
 - o. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
 - p. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
 - q. Procedures for formal progress reports, including scope and frequency.
 - r. Procedures for formal deficiency reports, including scope, frequency and distribution.
- D. Field Logs: Submit at least twice a week to the Commissioning Authority.
- E. Progress Reports.
- F. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Submit to the Commissioning Authority within two weeks after completion of testing, adjusting, and balancing.
 - 2. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
 - 4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 6. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
 - 7. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Project Architect.
 - g. Project Engineer.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC (NSTSB), AABC National Standards for Total System Balance.
 - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 - 3. SMACNA (TAB).
 - 4. Maintain at least one copy of the standard to be used at project site at all times.
- B. A minimum of two air balance test shall be completed for the project. One shall be completed prior to any demolition is made to test existing systems in scope of work. Second test shall begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

2. Certified by the following:
 - a) AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
3. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 1. Systems are started and operating in a safe and normal condition.
 2. Temperature control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 5. Duct systems are clean of debris.
 6. Fans are rotating correctly.
 7. Fire and volume dampers are in place and open.
 8. Air coil fins are cleaned and combed.
 9. Access doors are closed and duct end caps are in place.
 10. Air outlets are installed and connected.
 11. Duct system leakage is minimized.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

3.03 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.04 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
 1. Running log of events and issues.
 2. Discrepancies, deficient or uncompleted work by others.
 3. Contract interpretation requests.
 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner and / or project inspector.

3.05 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- G. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- H. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- I. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.02 inches negative static pressure storage rooms.

3.06 SCOPE

- A. Test, adjust, and balance the following:
 - 1. Ducted Split Units.
 - 2. Ductless Split Units.
 - 3. Fans.
 - 4. Air Filters.
 - 5. Air Inlets and Outlets.

3.07 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
 - 1. Manufacturer.
 - 2. Model/Frame.
 - 3. HP/BHP.
 - 4. Phase, voltage, amperage; nameplate, actual, no load.
 - 5. RPM.
 - 6. Service factor.
 - 7. Starter size, rating, heater elements.
 - 8. Sheave Make/Size/Bore.
- B. V-Belt Drives:
 - 1. Identification/location.
 - 2. Required driven RPM.
 - 3. Driven sheave, diameter and RPM.
 - 4. Belt, size and quantity.
 - 5. Motor sheave diameter and RPM.
 - 6. Center to center distance, maximum, minimum, and actual.
- C. Air Moving Equipment:
 - 1. Location.
 - 2. Manufacturer.
 - 3. Model number.
 - 4. Serial number.
 - 5. Arrangement/Class/Discharge.
 - 6. Air flow, specified and actual.
 - 7. Return air flow, specified and actual.
 - 8. Outside air flow, specified and actual.

9. Total static pressure (total external), specified and actual.
 10. Inlet pressure.
 11. Discharge pressure.
 12. Sheave Make/Size/Bore.
 13. Number of Belts/Make/Size.
 14. Fan RPM.
- D. Return Air/Outside Air:
1. Identification/location.
 2. Design air flow.
 3. Actual air flow.
 4. Design return air flow.
 5. Actual return air flow.
 6. Design outside air flow.
 7. Actual outside air flow.
 8. Return air temperature.
 9. Outside air temperature.
 10. Required mixed air temperature.
 11. Actual mixed air temperature.
 12. Design outside/return air ratio.
 13. Actual outside/return air ratio.
- E. Exhaust Fans:
1. Location.
 2. Manufacturer.
 3. Model number.
 4. Serial number.
 5. Air flow, specified and actual.
 6. Total static pressure (total external), specified and actual.
 7. Inlet pressure.
 8. Discharge pressure.
 9. Sheave Make/Size/Bore.
 10. Number of Belts/Make/Size.
 11. Fan RPM.
- F. Duct Traverses:
1. System zone/branch.
 2. Duct size.
 3. Area.
 4. Design velocity.
 5. Design air flow.
 6. Test velocity.
 7. Test air flow.
 8. Duct static pressure.
 9. Air temperature.
 10. Air correction factor.
- G. Duct Leak Tests:
1. Description of ductwork under test.
 2. Duct design operating pressure.
 3. Duct design test static pressure.
 4. Duct capacity, air flow.
 5. Maximum allowable leakage duct capacity times leak factor.
 6. Test apparatus:
 - a) Blower.
 - b) Orifice, tube size.

- c) Orifice size.
 - d) Calibrated.
- 7. Test static pressure.
- 8. Test orifice differential pressure.
- 9. Leakage.
- H. Air Distribution Tests:
 - 1. Air terminal number.
 - 2. Room number/location.
 - 3. Terminal type.
 - 4. Terminal size.
 - 5. Area factor.
 - 6. Design velocity.
 - 7. Design air flow.
 - 8. Test (final) velocity.
 - 9. Test (final) air flow.
 - 10. Percent of design air flow.

END OF SECTION 23 0593

**SECTION 23 0713
DUCT INSULATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Duct liner.

1.02 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
- C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2017.
- D. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material) 2019.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- G. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).
- H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.06 FIELD CONDITIONS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or ASTM E84.

2.02 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
 - 1. Knauf Insulation: www.knaufinsulation.com.
 - 2. Johns Manville: www.jm.com.
 - 3. Owens Corning Corporation: www.ocbuildingspec.com.
 - 4. CertainTeed Corporation: www.certainteed.com.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s m), when tested in accordance with ASTM E96/E96M.

2.03 DUCT LINER

- A. Manufacturers:
 - 1. Knauf Insulation: www.knaufinsulation.com.
 - 2. Johns Manville: www.jm.com.
 - 3. CertainTeed Corporation: www.certainteed.com/#sle.
- B. Note: Choose the liner type - Elastomeric Foam or Glass Fiber.
- C. Insulation: Incombustible glass fiber complying with ASTM C 1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer or acrylic polymer shown to be fungus and bacteria resistant by testing to ASTM G 21.
 - 1. Apparent Thermal Conductivity: Maximum of [.24] at 75 degrees F.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated ducts conveying air below ambient temperature:
 - 1. Finish with tape and vapor barrier jacket.
 - 2. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
- D. Insulated ducts conveying air above ambient temperature:
- E. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with with calked aluminum jacket with seams located on bottom side of horizontal duct section.
- F. External Duct Insulation Application:
 - 1. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
 - 2. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.

G. Duct and Plenum Liner Application:

1. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
2. Seal and smooth joints. Seal and coat transverse joints.
3. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.
4. Line supply and return ductwork 10 feet away from fans.

3.03 R-VALUE FOR INSULATION ON DUCTS SHALL BE PER TITLE-24 REQUIREMENTS

END OF SECTION 23 0713

SECTION 23 07 19
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 07 84 00 - Firestopping.
- C. Section 23 23 00 - Refrigerant Piping: Placement of inserts.

1.03 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019.
- D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.
- E. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2016.
- F. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.
- G. ASTM C1695 - Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service; 2018a.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 FLEXIBLE ELASTOMERIC CELLULAR INSULATION (REFRIGERANT PIPING)

- A. Manufacturer:
 - 1. Armacell LLC: www.armacell.us/#sle.
 - 2. BFG Industries.
 - 3. K-Flex USA LLC; K-Flex Titan: www.kflexusa.com/#sle.
 - 4. Rubatex: www.rbxcorp.com.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
 - 1. Minimum Service Temperature: Minus 40 degrees F.
 - 2. Maximum Service Temperature: 180 degrees F.
 - 3. Connection: Waterproof vapor barrier adhesive.

2.03 JACKETS

- A. PVC Plastic.
 - 1. Manufacturers:
 - a. Johns Manville Corporation: www.jm.com.
 - 2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F.
 - b. Maximum Service Temperature: 150 degrees F.
 - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil.
 - e. Connections: Brush on welding adhesive.
- B. ABS Plastic:
 - 1. Manufacturers:
 - a. Johns Manville Corporation: www.jm.com
 - 2. Jacket: zone piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: Minus 40 degrees
 - b. Maximum Service Temperature: 180 degree.
 - c. Moisture Vapor Permeability: 0.012 perm. inch, when tested in accordance with ASTM E96/E96M.
 - 3. Covering Adhesive Mastic: Compatible with insulation.
 - 4. Thickness: 30 mil.
- C. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
 - 1. Thickness: 0.016 inch sheet.
 - 2. Finish: Smooth.
 - 3. Joining: Longitudinal slip joints and 2 inch laps.
 - 4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 - 5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- A. Install in accordance with NAIMA National Insulation Standards.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.

- C. Insulated Pipes Conveying Fluids Below Ambient Temperature:
 - 1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- D. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- E. Install insulation on piping accessories requiring future re-occurring access and service with factory fabricated insulation covers that are easily removed and reapplied.
- F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.
- I. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation without jacketing.
- J. Buried Piping: Provide factory-fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.
- K. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULE - SEE SHEETS M0.01

END OF SECTION 23 0719

SECTION SECTION 23 2300
SECTION REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping.
- B. Refrigerant.
- C. Moisture and liquid indicators.
- D. Valves.
- E. Strainers.
- F. Filter-driers.
- G. Solenoid valves.

1.02 REFERENCE STANDARDS

- A. AHRI 710 - Performance Rating of Liquid-Line Driers; 2009.
- B. AHRI 760 - Performance Rating of Solenoid Valves for Use With Volatile Refrigerants; 2007.
- C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2016, with Addendum (2017).
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.
- E. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.
- F. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2016.
- G. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2016.
- H. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2018.
- I. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2018.
- J. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011 (Amended 2012).
- K. UL 429 - Electrically Operated Valves; Current Edition, Including All Revisions.
- L. All refrigerants shall meet CMC Chapter 11.

1.03 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.
- C. Liquid Indicators:
 - 1. Use line size liquid indicators in main liquid line leaving condenser.
 - 2. If receiver is provided, install in liquid line leaving receiver.
- D. Valves:
 - 1. Use service valves on suction and discharge of compressors.
 - 2. Use gauge taps at compressor inlet and outlet.
- E. Filter-Driers:
 - 1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
- F. Solenoid Valves:
 - 1. Use in liquid line of single or multiple evaporator systems.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.
- C. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.
- D. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store piping and specialties in shipping containers with labeling in place.
- B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
- C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.01 PIPING

- A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
 - 1. Fittings: ASME B16.22 wrought copper.
 - 2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.
- B. Copper Tube to 7/8 inch OD: ASTM B88 (ASTM B88M), Type K (A), annealed.
 - 1. Fittings: ASME B16.26 cast copper.
 - 2. Joints: Flared.
- C. Pipe Supports and Anchors:
 - 1. Conform to ASME B31.5
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.

2.02 MOISTURE AND LIQUID INDICATORS

- A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.03 VALVES

- A. Service Valves:
 - 1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi.

2.04 FILTER-DRIERS

- A. Performance:
 - 1. Flow Capacity - Liquid Line: per manufacturer's recommendation, minimum, rated in accordance with AHRI 710.
 - 2. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.
 - 3. Design Working Pressure: 350 psi, minimum.
- B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.
- C. Construction: UL listed.
 - 1. Connections: As specified for applicable pipe type.

2.05 SOLENOID VALVES

- A. Valve: AHRI 760 I-P, pilot operated, copper, brass or steel body and internal parts, synthetic seat, stainless steel stem and plunger assembly (permitting manual operation in case of coil

failure), integral strainer, with flared, solder, or threaded ends; for maximum working pressure of 500 psi.

- B. Coil Assembly: UL 429, UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box with pilot light.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and avoid interference with use of space.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- E. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.5.
 - 2. Support horizontal piping as indicated.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.
- F. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.
- G. Provide clearance for installation of insulation and access to valves and fittings.
- H. Provide access to concealed valves and fittings. Coordinate size and location of access doors with Section 08 31 00.
- I. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

3.03 FIELD QUALITY CONTROL

- A. A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. B. Test refrigeration system in accordance with ASME B31.5.
- C. C. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using halide torch. Test to no leakage.
- D. D. Refrigerant piping shall be provided with insulation. All exterior insulation shall be provided with an aluminum jacket and UV protection.

END OF SECTION 23 2300

**SECTION 23 31 00
HVAC DUCTS AND CASINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ductwork.

1.02 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.
- D. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems 2018.
- E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).
- F. SMACNA (FGD) - Fibrous Glass Duct Construction Standards 2003.
- G. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors current edition, including all revisions.

1.03 PERFORMANCE REQUIREMENTS

- A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.04 SUBMITTALS

- A. Product Data: Provide data for duct materials, duct liner, and duct connections.
- B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.05 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.

2.02 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.
- B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - 2. VOC Content: Not more than 250 g/L, excluding water.
 - 3. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.

- C. Flexible Ducts:
 - 1. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
 - a. Pressure Rating: 10 inches WG (2.50 kPa) positive and 1.0 inches WG (250 Pa) negative.
 - b. Maximum Velocity: 4000 fpm (20.3 m/sec).
 - c. Temperature Range: -20 degrees F to 210 degrees F (-28 degrees C to 99 degrees C).
- D. Insulated Flexible Ducts:
 - 1. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.
 - d. Pressure Rating: 10 inches WG (2.50 kPa) positive and 1.0 inches WG (250 Pa) negative.
 - e. Maximum Velocity: 4000 fpm (20.3 m/sec).
 - f. Temperature Range: -20 degrees F to 210 degrees F (-28 degrees C to 99 degrees C).
 - 2. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or ASTM E84
- E. Low Pressure Supply (Heating Systems): 2 inch w.g. (500 Pa) pressure class, galvanized steel. For 100% OSA Make-up Air Unit: Contractor shall coat the interior of supply duct and ductwork exposed to the atmosphere with LUVATA or RAHN coating.
- F. Low Pressure Supply (System with Cooling Coils): 2 inch w.g. (500 Pa) pressure class, galvanized steel.
- G. Return and Relief: 2 inch w.g. (500 Pa) pressure class, galvanized steel.
- H. General Exhaust: 2 inch w.g. (250 Pa) pressure class, galvanized steel. Coat interior of exhaust duct exhausting direct outside air through louvers.
- I. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
- J. Outside Air Intake: 2 inch w.g. (250 Pa) pressure class, galvanized steel. For 100% OSA Make-up Air Unit: Contractor to coat interior of supply duct with LUVATA or RAHN coating.
- K. Hanger Rod: ASTM A 36/A 36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.03 DUCTWORK FABRICATION

- A. Fabricate ductwork gauge in accordance with current (CMC) California Mechanical Code and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- C. Tee's, bends, and elbows: Construct according to (CMC) California Mechanical Code and SMACNA (DCS).
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- E. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).
- F. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.
- G. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.04 DUCT MANUFACTURERS

- A. Metal-Fab, Inc: www.mtlfab.com.
- B. SEMCO Incorporated: www.semcoinc.com.
- C. United McGill Corporation: www.unitedmcgill.com.

2.05 MANUFACTURED DUCTWORK AND FITTINGS

- A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install and seal ducts in accordance with SMACNA (DCS).
- B. Install in accordance with manufacturer's instructions.
- C. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- D. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- E. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- F. Locate ducts and dampers with sufficient space around equipment to allow normal operating and maintenance activities.
- G. Use crimp joints with or without bead for joining round duct sizes 8 inch (200 mm) and smaller with crimp in direction of air flow.
- H. Use double nuts and lock washers on threaded rod supports.
- I. Connect terminal units to supply ducts directly or with one foot (300 mm) maximum length of flexible duct. Do not use flexible duct to change direction.
- J. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.
- K. At exterior wall louvers, seal duct to louver frame and install blank-out panels.
- L. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

3.02 CLEANING

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

END OF SECTION 23 3100

**SECTION 23 3300
AIR DUCT ACCESSORIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air turning devices/extractors.
- B. Backdraft dampers.
- C. Duct access doors.
- D. Duct test holes.
- E. Flexible duct connections.
- F. Volume control dampers.

1.02 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).
- C. UL 33 - Safety Heat Responsive Links for Fire-Protection Service Current Edition, Including All Revisions.
- D. UL 555 - Standard for Fire Dampers Current Edition, Including All Revisions.
- E. UL 555S - Standard for Smoke Dampers Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, and hardware used. Include electrical characteristics and connection requirements.
- B. Manufacturer's Installation Instructions: Provide instructions for fire dampers and combination fire and smoke dampers.

1.04 QUALITY ASSURANCE

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

- A. Manufacturers:
 - 1. Krueger-HVAC, Division of Air System Components: www.krueger-hvac.com/#sle.
 - 2. PCI Industries, Inc; Pottorff Brand : www.pottorff.com.
 - 3. Ruskin Company: www.ruskin.com/#sle.
 - 4. Titus HVAC, a brand of Johnson Controls: www.titus-hvac.com/#sle.
- B. Multi-blade device with radius blades attached to pivoting frame and bracket, steel construction, with worm drive mechanism with removable key operator.

2.02 BACKDRAFT DAMPERS

- A. Manufacturers:
 - 1. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com/#sle.
 - 2. Nailor Industries, Inc: www.nailor.com/#sle.
 - 3. PCI Industries, Inc; Pottorff Brand : www.pottorff.com.
 - 4. Ruskin Company: www.ruskin.com/#sle.

- B. Gravity Backdraft Dampers, Size 18 by 18 inches (450 by 450 mm) or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.03 DUCT ACCESS DOORS

- A. Manufacturers:
 - 1. Nailor Industries, Inc: www.nailor.com.
 - 2. Ruskin Company: www.ruskin.com.
 - 3. SEMCO LLC: www.semcohvac.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.

2.04 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.05 FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Flexible Duct Connections: Fabric crimped into metal edging strip.
 - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd (1.0 kg/sq m).
 - a. Net Fabric Width: Approximately 6 inches (150 mm) wide.
 - 2. Metal: 3 inches (75 mm) wide, 24 gage, 0.0239 inch (0.61 mm) thick galvanized steel.

2.06 VOLUME CONTROL DAMPERS

- A. Manufacturers:
 - 1. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com/#sle.
 - 2. Nailor Industries, Inc: www.nailor.com/#sle.
 - 3. PCI Industries, Inc; Pottorff Brand : www.pottorff.com.
 - 4. Ruskin Company: www.ruskin.com/#sle.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch (150 x 760 mm).
- D. Quadrants:
 - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 31 00 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch (200 x 200 mm) size for hand access, 18 x 18 inch (450 x 450 mm) size for shoulder access, and as indicated. Provide 4 x 4 inch (100 x 100 mm) for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. Provide combination fire and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings, and hinges.

- F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.
- G. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- H. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- I. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION 23 3300

SECTION 23 3423
HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Inline/Ceiling centrifugal fans.

1.02 REFERENCE STANDARDS

- A. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data 2014.
- B. UL 705 - Power Ventilators Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- B. Manufacturer's Instructions: Indicate installation instructions.

1.04 FIELD CONDITIONS

- A. Permanent ventilators may not be used for ventilation during construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Greenheck Fan Corporation: www.greenheck.com.
- B. Loren Cook Company: www.lorencook.com.
- C. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 INLINE/CEILING CENTRIFUGAL FANS

- A. Manufacturers:
 - 1. Greenheck Fan Corporation: www.greenheck.com.
 - 2. Loren Cook Company: www.lorencook.com.
- B. Centrifugal Fan Unit: Direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.
- C. Grille: Molded white plastic. (For Ceiling type only).
- D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure roof exhausters and supply fans with cadmium plated steel lag screws to roof curb.
- C. Hung Cabinet Fans:
 - 1. Install flexible connections specified in Section 23 33 00 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch (25 mm) flex between ductwork and fan while running.
- D. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.
- E. Install backdraft dampers on inlet to roof exhausters.
- F. Install backdraft dampers on outlet to supply fans.

3.02 SCHEDULES SHOWN ON SHEET M0.02.

END OF SECTION 23 3423

**SECTION 23 37 00
AIR OUTLETS AND INLETS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Diffusers.
- B. Registers/grilles.
- C. Gravity Ventilators.

1.02 REFERENCE STANDARDS

- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating 2015.
- B. AMCA 511 - Certified Ratings Program for Air Control Devices 2010.
- C. AMCA 550 - Test Method for High Velocity Wind Driven Rain Resistant Louvers 2015, with Editorial Revision (2018).
- D. ARI 890 - Standard for Air Diffusers and Air Diffuser Assemblies; Air-Conditioning and Refrigeration Institute; 2008.
- E. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets 2006 (Reaffirmed 2011).
- F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2014.
- G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2013.
- H. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).

1.03 SUBMITTALS

- A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.04 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Krueger: www.krueger-hvac.com.
- B. Price Industries: www.price-hvac.com.
- C. Titus: www.titus-hvac.com.

2.02 RECTANGULAR CEILING DIFFUSERS

- A. Type: Provide square, adjustable pattern, stamped, multi-core diffuser to discharge air in four way pattern with sectorizing baffles where indicated.
- B. Frame: Inverted T-bar type. In plaster ceilings, provide plaster frame and ceiling frame.
- C. Fabrication: Aluminum with baked enamel off-white finish.

2.03 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

- A. Type: Streamlined blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing, with blades set at 45 degrees, vertical face.
- B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting.
- C. Fabrication: Steel with 20 gage, 0.0359 inch (0.91 mm) minimum frames and 22 gage, 0.0299 inch (0.76 mm) minimum blades, steel and aluminum with 20 gage, 0.0359 inch (0.91 mm) minimum frame, or aluminum extrusions, with factory baked enamel finish.

- D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

2.04 WALL SUPPLY REGISTERS/GRILLES

- A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille with double deflection.
- B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.
- C. Fabrication: Aluminum extrusions with factory clear lacquer finish.
- D. Color: To be selected by Architect from manufacturer's standard range.
- E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.05 WALL EXHAUST AND RETURN REGISTERS/GRILLES

- A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, vertical face.
- B. Frame: 1-1/4 inch margin with countersunk screw mounting.
- C. Fabrication: Aluminum extrusions, with factory baked enamel finish.
- D. Color: To be selected by Architect from manufacturer's standard range.
- E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with airtight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

3.02 SCHEDULES SHOWN ON SHEET M0.01.

END OF SECTION 23 3700

**SECTION 23 40 00
HVAC AIR CLEANING DEVICES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Disposable, extended area panel filters.

1.02 REFERENCE STANDARDS

- A. AHRI 850 (I-P) - Standard for Performance Rating of Commercial and Industrial Air Filter Equipment 2013.
- B. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size 2017, with Addendum a.
- C. UL 900 - Standard for Air Filter Units Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.

PART 2 PRODUCTS

2.01 FILTER MANUFACTURERS

- A. American Filtration Inc: www.americanfiltration.com.
- B. AAF International/American Air Filter: www.aafintl.com.
- C. The Camfil Group: www.camfilfarr.com.

2.02 DISPOSABLE, EXTENDED AREA PANEL FILTERS

- A. Media: UL 900 Class 1, pleated, lofted, non-woven, reinforced cotton fabric; supported and bonded to welded wire grid by corrugated aluminum separators.
 - 1. Frame: Non-flammable.
 - 2. Nominal size: 24 by 24 inches (305 by 610 mm).
 - 3. Nominal thickness: 2 inches (50 mm).
- B. Minimum Efficiency Reporting Value (MERV): 13, when tested in accordance with ASHRAE Std 52.2.
- C. Rating, per ASHRAE Std 52.2:
 - 1. Weight arrestance: 97 percent.
 - 2. Initial resistance at 500 FPM (2.54 m/sec) face velocity: 0.30 inch WG (50 Pa).
 - 3. Recommended final resistance: 1.0 inch WG (224 Pa).

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install air cleaning devices in accordance with manufacturer's instructions.
- B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.
- C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

END OF SECTION 23 4000

**SECTION 26 0010
BASIC ELECTRICAL REQUIREMENTS**

PART 1 GENERAL

1.01 SCOPE

- A. This section supplements all sections of this division and shall apply to all phases of work hereinafter specified, shown on the drawings, or required to provide a complete installation of electrical systems for the Project. The work required under this division is not limited to the electrical specifications and drawings. Refer to all bid documents including Civil, Architectural, Structural, and Mechanical documents which may designate Work to be accomplished. The intent of the Specifications is to provide a complete and operable electrical system, which shall include all documents that are a part of the entire Project Contract.
 - 1. Work included: Furnish all labor, material, tools, equipment, facilities, transportation, skilled supervision necessary for, and incidental to, performing operations in connection with furnishing, delivery, and installation of the work in this division complete as shown or noted on the Drawings and specified herein.
- B. Related Work Specified Elsewhere:
 - 1. Refer to all sections in the general contract conditions, Contract Requirements and Division 1, General Requirements.
- C. Work Installed but Furnished by Others:
 - 1. The electrical work includes the installation or connection of certain materials and equipment furnished by others. Verify installation details. Foundations for apparatus and equipment will be furnished by others unless otherwise noted or detailed.

1.02 GENERAL REQUIREMENTS

- A. Guarantee See General Conditions:
 - 1. Except as may be specified under other Sections in the specification, guarantee equipment furnished under the specifications for a period of one year, except for equipment required to have a longer guarantee period, from date of final completion. Guarantee all work against defective workmanship, material, and improper installation. Upon notification of failure, correct deficiency immediately and without additional cost to the Owner.
 - 2. Standard warranty of manufacturer shall apply for replacement of parts after expiration of the above period. Manufacturer shall furnish replacement parts to the Owner or his service agency as approved. Furnish to the Owner, through the Architect, printed manufacturer's warranties complete with material included and expiration dates, upon completion of project. Conform to Division 01.
- B. Equipment Safety: 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.
- C. Codes and Regulations:
 - 1. Design, manufacturer, testing and method of installation of all apparatus and materials furnished under the requirements of these specifications shall conform to the latest publications or standard rules of the following:
 - a. Institute of Electrical and Electronic Engineers - IEEE
 - b. National Electrical Manufacturers' Association - NEMA
 - c. Underwriters' Laboratories, Inc. - UL
 - d. National Fire Protection Association - NFPA
 - e. American Society for Testing and Materials - ASTM
 - f. American National Standards Institute - ANSI
 - g. California Electrical Code - CEC, Title 24, Part 3
 - h. California Code of Regulations, Title 8, Subchapter 5

- i. California Building Code-CBC, Title 24 Parts 1 &2
 - j. State & Municipal Codes in Force in the Specific Project Area
 - k. Occupational Safety & Health Administration - OSHA
 - l. California State Fire Marshal
 - m. California Fire Code- CFC, Title 24 Part 9
 - n. National Electrical Testing Association - NETA
 2. The term "Code", when used within the specifications, shall refer to the Publications, Standards, ordinances and codes, listed above. In the case where the codes have different levels of requirements the most stringent rules shall apply.
- D. Requirements of Regulatory Agencies:
 1. Codes, Permits, and Fees: Where the Contract Documents exceed minimum requirements, the Contract Documents take precedence. Where code conflicts occur, the most stringent shall apply. The most stringent condition shall be as interpreted by the Engineer.
 - a. Comply with all requirements for permits, licenses, fees and Code. Permits, licenses, fees, inspections and arrangements required for the Contractor at his expense shall obtain the Work, unless otherwise specified.
 - b. Comply with the requirements of the applicable utility companies serving the Project. Make all arrangements with the utility companies for proper coordination of the Work.
- E. Shop Drawings:
 1. See Division 01 for additional requirements.
 2. Time Schedules for Submission and Ordering: The Contractor shall prepare, review and coordinate his schedule of submissions carefully, determining the necessary lead time for preparing, submitting, checking, ordering and delivery of materials and equipment for timely arrival. The Contractor shall be responsible for conformance with the overall construction schedule.
 3. Submittals will be checked for general compliance with specifications only. The Contractor shall be responsible for deviations from the drawings or specifications and for errors or omissions of any sort in submittals.
 4. Submit a complete list of materials and equipment proposed for the job, including manufacturers names and catalog numbers.
 5. Shop drawings shall be submitted in completed groups of materials (i.e., lighting fixtures or switchgear). The Contractor shall add and sign the following paragraph on equipment and materials submitted for review. "It is hereby certified that the (equipment) (material) shown and marked in this submittal is that proposed to be incorporated into the project; is in compliance with the Contract Drawings and specifications and can be installed in the allocated spaces". Failure to add the above written statement for compliance will result in return of submittals without review.
 - a. Bind catalog cuts, plate numbers, descriptive bulletins and drawings, 11" x 17" (275 mm x 435 mm) or smaller, in sets with covers neatly showing titles.
 - b. The Contractor shall verify dimensions of equipment and be satisfied as to Code compliance for fit prior to submitting shop drawings for approval.
 - c. Where current limiting devices are specified, submit technical data to substantiate adequate protection of equipment cascaded downstream. Submittals shall not be reviewed unless supporting calculations and data are submitted therewith.
 - d. Include complete catalog information such as construction, ratings, insulation systems, as applicable.
 - e. For any material specified to meet UL or trade standards, furnish the manufacturers or vendor's certification that the material furnished for the work does in fact equal or exceed such specifications.
 - f. Reference listings to the specifications' Sections and Article to which each is applicable.

- g. Equipment Floor Plans: After approval of material is secured prepare a floor plan of each electrical and communication equipment space, room or yard, drawn to scale at 1/2 inch equals 1 foot and submit for approval in the same manner as for shop drawings. The layout drawings shall be exact scale.
 - 6. Contractor shall prepare coordinated drawings when required by Division 01 or where noted otherwise.
- F. Interpretations: The Contractor through the Architect must make Requests for interpretations of drawings and specifications. Any such requests made by equipment manufacturers or suppliers will be referred to the Contractor.
- G. Standard of Quality
 - 1. The contract Drawings and Specifications establish the "MINIMUM STANDARD OF QUALITY" each product and/or system must meet to be considered acceptable. Products of other manufactures will be considered if the product and/or system meet or exceed the "MINIMUM STANDARD OF QUALITY" established by this Contract Document.
 - 2. Items for similar application shall be of the same manufacturer.
 - 3. The label of listing by UL shall appear on all materials and equipment for which standards have been established by the agency.
 - 4. Where codes as listed in Section General Requirement Section of the Specifications that establish label or approved requirements, furnish all materials and equipment with either the required labels affixed or the necessary written approval.
 - 5. Provide the type and quantity of electrical materials and equipment necessary to complete Work and all systems in operation, tested and ready for use.
 - 6. Provide and install all incidental items that belong to the Work described and which are required for complete systems.
 - 7. All switchboards, distribution boards, panel boards and circuit breakers shall be of the same manufacturer.
 - 8. All wiring devices such as switches and receptacles shall be of the same manufacturer.
- H. Substitutions: Refer to Division 01
- I. Submit comprehensive material list, shop drawings and complete technical data for the following equipment and materials:
 - 1. General Requirements:
 - a. Panelboards.
 - b. Conduits
 - c. Conductors, include all selected insulation types.
 - d. Fuses
 - e. Disconnect switches and Starters.
 - f. Pullboxes, manholes and handholes.
 - g. Standard lighting fixtures, specially fabricated fixtures, ballasts and lamps, with samples and sample of standard finish available (where requested).
 - h. Control devices, standard and special receptacles, switches, outlets and finish device plates.
 - i. Cabinets for signal and telephone system, special terminals and cabinets. Include all cabinet dimensions.
 - j. Fire alarm system.
 - k. Transformers
 - l. Data/telephone cables, devices and terminations.
 - m. Security System.
 - n. Public Address System.

J. Utility Service:

1. Contractor shall verify the locations shown on the drawings and shall include extensions of lines to building service from locations which are acceptable to the Owner.
2. Verify electrical, civil, architectural and structural, dimensional and other requirements with the Owner.
3. Should any major modifications to the work indicated be necessary to comply with the Owner requirements, notify the Architect.
4. Contractor shall contact the utility company representatives to establish pre-construction coordination, obtain all necessary meters and/or approvals, and schedule utility work to coordinate with the construction schedule.
5. All utility services shall be installed per the utility company requirements. Verify final construction requirements with utility company service planners prior to construction.

K. Work Responsibilities:

1. The drawings indicate diagrammatically the desired locations or arrangement of conduit runs, outlets, junction boxes and equipment and are to be followed. Execute the work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations. The Contractor is responsible for the correct placing of his work. Where conflicts occur in plans and/or specifications, the most stringent application shall apply and shall be part of the base bid.
2. Locations shown on architectural plan or on wall elevations shall take precedence over electrical plan locations, but where a major conflict is evident, notify the Architect.
3. In the event minor changes in the indicated locations or arrangement are necessary due to developed conditions in the building construction or rearrangement of furnishings or equipment or due to interference with other trades, such changes shall be made without extra cost.
4. Verify dimensions and the correct location of Owner-Furnished equipment before proceeding with the roughing-in of connections.
5. All scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with work carefully check and verify dimensions and sizes with the drawings to see that the furnished equipment will fit into the spaces provided without violation of applicable Codes.
6. Should any changes to the work indicated on the drawings or described in the specifications be necessary in order to comply with the above requirements, notify the Architect.
7. Contractor shall be responsible for coordination of coordinated drawings when required by the Architect.
8. Replace or repair, without additional compensation any work which does not comply with or which is installed in violation of any of these requirements.

L. Installation General: For special requirements, refer to specific equipment under these requirements.

1. Unless otherwise specified elsewhere in the specifications, do all excavating necessary for the proper installation of the electrical work.
2. Locations of Openings: Locate chases, shafts and openings required for the installation of the electrical work during framing of the structure. Do any additional cutting and patching required. Cutting or drilling in any structural member is prohibited without approval of the Architect. Furnish all access panels to make all boxes, connections and devices accessible as required by CEC.
3. Location of Sleeves: Where conduits pass through concrete walls, suspended slabs or metal deck floors, install sleeves of adequate size to permit installation of conduit.

- Sleeves shall be installed prior to pouring of concrete and shall have ends flush with the wall or extend 2 inches above floor surfaces. Verify locations.
4. Wherever conduit extends through roof, install flashings in accordance with drawings and details.
 5. Contractor shall be responsible for cutting and patching which may be required for the proper installation of the electrical work.
 6. Protect work, materials and equipment and provide adequate and proper storage facilities during the progress of the work. Storage outdoors shall be weather protected and shall include space heaters to prevent condensation. Provide for the safety and good condition of all work until final acceptance of the work. Replace all damaged or defective work, materials and equipment before requesting final acceptance.
 7. Conduit and Equipment to be Installed: Clean thoroughly to remove plaster, spattered paint, cement and dirt on both exterior and interior. All underground conduits shall be mandrelled prior to pulling wire.
 8. Conduit and Equipment to be Painted: Clean conduit exposed to view in completed structure by removing plaster and dirt. Remove grease, oil and similar material from conduit and equipment by wiping with clean rags and suitable solvents in preparation for paint.
 9. Items with Factory Finish: Remove cement, plaster, grease and oil, and leave surfaces, including cracks and corners, clean and polished. Touch up scratched or bare spots to match finish.
 10. Site Cleaning: Remove from site all packing cartons, scrap materials and other rubbish on a weekly basis. Vacuum out all cabinets, switchgear and panels and junction boxes prior to pulling any conductors.
 11. Electrical equipment and materials exposed to public and in finished areas shall be finish-painted after installation in accordance with the Painting Section. All exposed screw-type fasteners, exterior, or interior in restrooms, shall be vandal-resistant spanner type; include tool.
- M. Excavation, Cutting and Patching:
1. Excavating, trenching and backfilling required for the work of this Division in accordance with the applicable requirements of Division 2. Excavating and backfilling connected with electrical work, repaving cuts and providing and maintaining protective measures for the electrical work excavation required by the governing authorities having jurisdiction shall be performed as a part of the work of this Division.
 2. Verify openings indicated on the drawings. Provide all cutting, patching and reinforcement of the construction of the building as required to install electrical work.
- N. Tests
1. Equipment and systems for which the National Electrical Testing Association (NETA) has an approved or recommended procedure, shall be tested in accordance with that procedure. Test values shall equal values recommended by NETA. Copies of test reports shall be submitted as required under shop drawing submittals.
 2. Resistance to ground tests shall be accomplished by a qualified independent testing firm to measure resistance to ground at grounding electrodes. Make tests before slabs or affected areas are poured in order that corrective measures, if required, may be taken. Submit a report showing the results of these measurements. If the resistances exceed values specified elsewhere or NETA test procedure recommendations, perform corrective measures required to reduce resistance to acceptable values.
 3. Prior to energizing any motor, measure the service voltage for phase balance and report if unbalance exceeds 1% from mean.
 4. Measure the three-phase voltage at no load and at maximum load conditions and submit to the engineer a report showing the results of these measurements.
 5. Upon completion of the work and adjustment of all equipment, conduct an operating test. Conduct the test in the presence of an authorized representative of the Owner's

- Representative. Demonstrate system and equipment to operate in accordance with requirements of the Contract Documents and to be free from electrical and mechanical defects. Provide systems free from short circuits and grounds and show an insulation resistance between phase conductors and ground not less than the requirements of the governing electric code. Test circuits for proper neutral connection.
6. Complete tests prior to final inspection of project, including corrective work based on the results of the tests.
 7. Perform special tests on systems and equipment as specified herein using personnel qualified to perform such tests.
- O. Protection: Protect finish parts of the materials and equipment against damage during the progress of the work and until final completion and acceptance. Cover materials and equipment in storage and during construction in such a manner that no finished surfaces will be damaged or marred. Keep moving parts clean, dry and lubricated.
- P. Cleaning Up:
1. Upon completion of the work and at various time during the progress of the work, remove from the building all surplus materials, rubbish and debris resulting from the work of this Division.
 2. Thoroughly clean switchgear including busses, apparatus, exposed conduit, metal work including the exterior and interior, and accessories for the work of this Division, of cement, plaster and other deleterious materials; remove grease and oil spots with cleaning solvent; carefully wipe surfaces and scrape cracks and corners clean.
 3. Thoroughly polish chromium or plated work. Remove dirt and stains from lighting fixtures.
 4. Leave the entire installation in a clean condition.
- Q. Completion:
1. The work will not be reviewed for final acceptance until operating and maintenance data, manufacturer's literature, panel directories and nameplates specified herein have been approved and properly posted or installed and final cleaning of equipment and premises has been completed.
 2. When the installation is complete and adjustments have been made, operate the system for a period of one week, during which time demonstrate that systems are completed and operating in conformance with the specifications.
- R. Operating and Maintenance Data: Submit complete and at one time, prior to acceptance of the installation, 4 copies of manufacturer's instructions for operation and maintenance of electrical equipment, including replacement parts lists. As specified in Division 01
- S. Inspection and Acceptance Procedures: The Architect will submit observation reports periodically during the construction phase detailing Contract deficiencies. The Contractor is responsible for making corrections immediately. Notice of Completion of the project will not be made until all items have been corrected.
- T. Final Completion of Electrical Systems:
1. Prior to Final Completion of operating electrical systems, the Contractor shall:
 - a. Provide materials of the type and quality specified and as necessary for proper operation, tested and ready for use.
 - b. Furnish the required Operating and Maintenance Data/Manuals.
 - c. Clean up of the project pertaining to this Division of the work.
 - d. After installation has been completed and adjustments made, operate the system for a period of one week, during which time, demonstrate to the Architect that systems are complete and operating in conformance with Contract Documents.
 - e. Conduct tests required and as specified in this Division and submit test reports and corrective actions taken.
 - f. Submission of warranties and guarantees.
 2. Final Completion of Work Shall be Contingent On:
 - a. Contractor replacing defective materials and workmanship.

- b. Upon completion of work and adjustments made, Contractor shall conduct an operating test for each system for approval at such time as Architect directs. Conduct test in presence of authorized representative of Architect and demonstrate that systems and equipment do operate in accordance with requirements of the Contract Documents and are free from electrical and mechanical defects.
 - c. Contractor shall provide the necessary training programs and instructions to the Owner's representative. Number of hours shall be a minimum of four (4) hours for each system or days as required under separate Sections of these Specifications. Complete operation and maintenance manuals shall be provided at least two (2) weeks prior to training.
 - d. Submit copies of manufacturer's instructions and maintenance of electrical equipment including replacement parts lists. Each set shall include one set of shop drawings of equipment installed.
- U. Submittals for Change Orders: When changes are made during the construction phase, deletions and additions shall be presented in a manner that will indicate the cost of each item of material and corresponding labor. Markup shall be then added in accordance with the requirements of the General Conditions as modified by the Supplementary Conditions.
- V. The Contractor at a time convenient to the Owner shall provide instruction to the Owner's operating personnel in the proper operation and maintenance of all equipment and systems. The instructors shall have received factory training and shall be thoroughly familiar with the equipment installed. The operating personnel shall receive the number of days instruction as indicated in other sections.

1.03 PROJECT RECORD DOCUMENTS

- A. Record Drawings: One full size set of electrical as-built plans plus one digital copy (in PDF format) shall be delivered to Owner.
- B. Record Set During the Work: At site, maintain at least one set of Drawings as a Field Record Set. Also maintain at least one copy of all Addenda, Modifications, approved submittals, correspondence, and transmittals at site. Keep Drawings and data in good order and readily available to Architect and Owner.
- C. Changes: Clearly and correctly mark Record Drawings to show changes made during the construction process at the time the changed work is installed. No such changes shall be made in the work unless authorized by the Architect.
- D. Final Record Drawings: Conform to Division 01 requirements.
- E. Preparation of Final Record Drawings: Contractor shall transfer recorded changes in the work indicated on the Field Record Set to the record set. Changes shall be neatly and clearly drawn and noted by skilled draftsmen, and shown technically correct.
- F. Approval: Prior to Architect's inspection for Substantial Completion, submit the Final Record Drawings to the Architect for review, and make such revisions as may be necessary for Final Record Drawings to be a true, complete, and accurate record of the work.
- G. Manuals: Obtain data from the various manufacturers and submit instruction, operation, and maintenance manuals as required and to the extent required under other Sections.
- H. At all times when the work is in progress, maintain at the workplace, fabrication shop or Project Site as applies, a complete separate, clean, undamaged set of the latest stamped, actioned submittals. As work progresses, maintain records of "as installed" conditions on this set in suitable ink or chemical fluid. Update the set daily. After successful completion of Project Site testing specified herein, and after completion of Punch List corrections, copy all records of "as installed" conditions on to originals.
- I. Quantity:
 - 1. Review sets: As for Shop and Field Drawings.
 - 2. Record set: Refer to Division 01.

- J. Content: All drawings required under "Field and Shop Drawings". Show "as installed" condition. Where room designations according to Project permanent signage differ from construction designations in the Contract Documents, show both designations.
- K. Warranty Certificates: Comply with Division 01.

END OF SECTION 26 0010

SECTION 26 0519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Wiring connectors.
- C. Electrical tape.
- D. Heat shrink tubing.
- E. Wire pulling lubricant.
- F. Cable ties.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.
- I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
- J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- L. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- M. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- N. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- B. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is not permitted.
- F. Armored cable is not permitted.
- G. Metal-clad cable is not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Provide new conductors and cables manufactured not more than one year prior to installation.
- D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system. Neatly group conductors in panels, switchgear and terminal cabinets, etc., and form in a manner to fan into terminals with regular spacing. Lace formed groups of conductors with Panduit Co. Nylon Straps Numbers "SST-4-H" or "SST-2". Lace larger conductors with Panduit Co. Nylon Sta-Straps Numbers "SSC-4-H" and tie anchors ETA-1, TA-2 or TM-1-2-3 or approved equal.
- E. Comply with NEMA WC 70.
- F. Conductor Material:
 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 3. Tinned Copper Conductors: Comply with ASTM B33.
- G. Minimum Conductor Size:
 1. Branch Circuits: 12 AWG.

- a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
 - 3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
- 2. Control Circuits: 14 AWG.
- H. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
 - 3. Color Code:
 - a. 480Y/277 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Neutral/Grounded: Gray.
 - b. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - d. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
 - 1. Copper Building Wire:
 - a. Cerro Wire LLC: www.cerrowire.com.
 - b. Encore Wire Corporation: www.encorewire.com.
 - c. Southwire Company: www.southwire.com.
 - d. Rome Wire and Cable.
 - e. Okonite Wire
 - f. Pirelli Wire and Cable
 - g. Carol Cable
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
 - a. Size 4 AWG and Larger: Type XHHW-2.
 - b. Installed Underground: Type XHHW-2.

2.04 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Wiring Connectors for Splices and Taps:
 - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.

2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- C. Wiring Connectors for Terminations:
 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
 4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
- D. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- G. Mechanical Connectors: Provide bolted type.
- H. Compression Connectors: Provide circumferential type or hex type crimp configuration.

2.05 WIRING ACCESSORIES

- A. Electrical Tape:
 1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
 2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
 3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
 4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
 5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
- C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
- D. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.

- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

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

3.03 INSTALLATION

- A. Circuiting Requirements:
 - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 - 2. When circuit destination is indicated without specific routing, determine exact routing required.
 - 3. Arrange circuiting to minimize splices.
 - 4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
 - 5. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
 - 6. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
 - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
 - 2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- G. Install conductors with a minimum of 12 inches of slack at each outlet.
- H. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.
- I. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- J. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- K. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.

2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 3. Do not remove conductor strands to facilitate insertion into connector.
 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- L. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
 3. Wet Locations: Use heat shrink tubing.
- M. Insulate ends of spare conductors using vinyl insulating electrical tape.
- N. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- O. Identify conductors and cables in accordance with Section 26 05 53.
- P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section Firestopping.
- Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
- C. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION 26 0519

**SECTION 26 0526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.

1.02 REFERENCE STANDARDS

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify exact locations of underground metal water service pipe entrances to building.
 - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
 - 3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.04 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- B. Field quality control test reports.
- C. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

- D. Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 - 2. Grounding Electrode System: Not greater than 25 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
- E. Grounding Electrode System:
 - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
 - 2. Metal Underground Water Pipe(s):
 - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
 - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
 - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
 - 3. Metal In-Ground Support Structure:
 - a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
 - 4. Concrete-Encased Electrode:
 - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
 - 5. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
- F. Bonding and Equipment Grounding:
 - 1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 - 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 - 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 - 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 - 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 - 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:

1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Make grounding and bonding connections using specified connectors.
 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- D. Identify grounding and bonding system components in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

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

END OF SECTION 26 0526

**SECTION 26 0529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.05 SUBMITTALS

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

1.06 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.

1.07 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 5 times the applied force. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 - 5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 - 6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
 - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 - 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
- D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 - 1. Comply with MFMA-4.
 - 2. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
- F. Anchors and Fasteners:
 - 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 - 2. New Concrete: Use preset concrete inserts.
 - 3. Existing Concrete: Use expansion anchors.
 - 4. Solid or Grout-Filled Masonry: Use expansion anchors.
 - 5. Hollow Masonry: Use toggle bolts.
 - 6. Hollow Stud Walls: Use toggle bolts.
 - 7. Steel: Use welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 8. Wood: Fasten with lag screws or through bolts.
 - 9. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

10. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.

3.03 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete or Cast-in-Place Concrete (Limited Applications)" as applicable.
- C. Anchor equipment to concrete base.
 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 3. Install anchor bolts according to anchor-bolt manufacturers written instructions.

3.04 FIELD QUALITY CONTROL

- A. Inspect support and attachment components for damage and defects.

- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 26 0529

**SECTION 26 0533.13
CONDUIT FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Not Used
- C. Flexible metal conduit (FMC).
- D. Liquidtight flexible metal conduit (LFMC).
- E. Electrical metallic tubing (EMT).
- F. Rigid polyvinyl chloride (PVC) conduit.
- G. Conduit fittings.
- H. Accessories.

1.02 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
- E. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.
- F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- G. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2005 (R2013).
- H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.
- I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.
- J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- L. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- M. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
- N. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- P. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
 - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.

5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.04 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- B. Project Record Documents: Record actual routing for conduits installed underground and conduits 2 inch (53 mm) trade size and larger.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
 1. Under Slab on Grade: Use rigid PVC conduit.
 2. Exterior, Direct-Buried: Use rigid PVC conduit.
 3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
 4. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use PVC-coated galvanized steel rigid metal conduit elbows for bends.
 5. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
 6. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.
- D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- E. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).
- F. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT).
- G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
- H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.
 1. Locations subject to physical damage include, but are not limited to:
 - a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
- J. Exposed, Exterior: Use galvanized steel rigid metal conduit.

- K. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit.
- L. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
 - 1. Maximum Length: 6 feet.
- M. Connections to Vibrating Equipment:
 - 1. Dry Locations: Use flexible metal conduit.
 - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 - 3. Maximum Length: 6 feet unless otherwise indicated.
 - 4. Vibrating equipment includes, but is not limited to:
 - a. Transformers.
 - b. Motors.
- N. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.02 CONDUIT REQUIREMENTS

- A. Provide "Red" conduit and Flexible conduit painted "red" for Fire Alarm Systems.
- B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 3/4 inch (21 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
 - 3. Control Circuits: 1/2 inch (16 mm) trade size.
 - 4. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.
 - 5. Underground, Exterior: 1 inch (27 mm) trade size.
- E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 NOT USED

2.05 FLEXIBLE METAL CONDUIT (FMC)

- A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.07 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use compression (gland) or set-screw type.
 - a. Do not use indenter type connectors and couplings.

2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated
 - 1. Provide Schedule 80 where subject to physical damage and in chemical and pump rooms subject to corrosion; rated for use with conductors rated 75 or 90 degrees C.
- B. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.09 ACCESSORIES

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

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- F. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated without specific routing, determine exact routing required.
 - 3. Conceal all conduits unless specifically indicated to be exposed.
 - 4. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
 - 5. Arrange conduit to maintain adequate headroom, clearances, and access.
 - 6. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
 - 7. Arrange conduit to provide no more than 150 feet between pull points.
 - 8. Route conduits above water and drain piping where possible.

9. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 10. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
 11. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
 - a. Heaters.
 - b. Hot water piping.
 - c. Flues.
 12. Group parallel conduits in the same area together on a common rack.
- G. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 4. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
 8. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
 9. Use of spring steel conduit clips for support of conduits is not permitted.
 10. Use of wire for support of conduits is not permitted.
- H. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 3. Use suitable adapters where required to transition from one type of conduit to another.
 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- I. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 4. Conceal bends for conduit risers emerging above ground.
 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
 8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- J. Underground Installation:
1. Minimum Cover, Unless Otherwise Indicated or Required:
 - a. Underground, Exterior: 24 inches.
 - b. Under Slab on Grade: 12 inches to bottom of slab.
 2. Provide underground warning tape in accordance with Section 26 05 53 along entire conduit length.
- K. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section Concrete with minimum concrete cover of 3 inches on all sides unless otherwise indicated.
- L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
 3. Where conduits are subject to earth movement by settlement or frost.
- M. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- N. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.
- O. Provide grounding and bonding in accordance with Section 26 05 26.
- P. Identify conduits in accordance with Section 26 05 53.

3.02 FIELD QUALITY CONTROL

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

3.03 CLEANING

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

3.04 PROTECTION

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

END OF SECTION 26 0533.13

**SECTION 26 0533.16
BOXES FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
- C. Boxes and enclosures for integrated power, data, and audio/video.
- D. Floor boxes.

1.02 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
 - 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
 - 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
 - 6. Coordinate the work with other trades to preserve insulation integrity.
 - 7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
 - 8. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.04 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for floor boxes and underground boxes/enclosures.
- B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Keys for Lockable Enclosures: Two of each different key.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 2. Use cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 3. Use suitable concrete type boxes where flush-mounted in concrete.
 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
 5. Use raised covers suitable for the type of wall construction and device configuration where required.
 6. Use shallow boxes where required by the type of wall construction.
 7. Do not use "through-wall" boxes designed for access from both sides of wall.
 8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
 12. Minimum Box Size, Unless Otherwise Indicated:
 - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
 - b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
 - c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
 13. Wall Plates: Comply with Section 26 27 26.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
 1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 3. Junction and Pull Boxes Larger Than 100 cubic inches:
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
 4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
 - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated. Terminate each conductor at a terminal block and identify with an engraved fiber

tag. Allow at least twelve (12) spare terminals. Provide terminal cabinets with 3/4 inch thick full size plywood backboard. Where minimum size of cabinet is not indicated, provide 8" width for each electronic system terminated in that enclosure, by 36" high.

- D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
- E. Floor Boxes:
 - 1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 27 26; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
 - 2. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
 - 3. Manufacturer: Same as manufacturer of floor box service fittings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Box Locations:
 - 1. Locate boxes to be accessible. Provide access panels in accordance with Section Access Panels as required where approved by the Architect.
 - 2. Unless dimensioned, box locations indicated are approximate.
 - 3. Locate boxes as required for devices installed under other sections or by others.
 - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.
 - 4. Locate boxes so that wall plates do not span different building finishes.
 - 5. Locate boxes so that wall plates do not cross masonry joints.
 - 6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 - 7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
 - 8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
 - 9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
 - b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
 - 10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.

11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
 - a. Concealed above accessible suspended ceilings.
 - b. Within joists in areas with no ceiling.
 - c. Electrical rooms.
 - d. Mechanical equipment rooms.
- H. Box Supports:
 1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
- I. Install boxes plumb and level.
- J. Flush-Mounted Boxes:
 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- K. Install boxes as required to preserve insulation integrity.
- L. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- M. Install firestopping to preserve fire resistance rating of partitions and other elements.
- N. Close unused box openings.
- O. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- P. Provide grounding and bonding in accordance with Section 26 05 26.

3.02 CLEANING

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

3.03 PROTECTION

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

END OF SECTION 26 0533.16

**SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- B. Section 26 27 26 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

1.03 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2015.
- E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- B. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

1.07 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.

- a. Panelboards:
 - 1) Identify ampere rating and name.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.
 - b. Transformers:
 - 1) Identify kVA rating and name.
 2. Service Equipment:
 - a. Use identification nameplate to identify each service disconnecting means.
 3. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70, including but not limited to the following.
 - a. Service equipment.
 - b. Industrial control panels.
 - c. Motor control centers.
 - d. Elevator control panels.
 - e. Industrial machinery.
 4. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
 - a. Minimum Size: 3.5 by 5 inches.
 - b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
- B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
 3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 - a. At each source and load connection.
 - b. Within boxes when more than one circuit is present.
 - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
 4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
- C. Identification for Raceways:
1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
 2. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
 3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
 4. Use underground warning tape to identify underground raceways.

- D. Identification for Boxes:
 - 1. Use voltage markers to identify highest voltage present.
 - 2. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
 - a. For exposed boxes in public areas, use only identification labels.
- E. Identification for Devices:
 - 1. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
 - 2. Use engraved wallplate to identify serving branch circuit for all receptacles.
 - a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
 - 3. Use engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
- F. Identification for Luminaires:
 - 1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
 - 1. General Requirements:
 - a. Provide nameplates for all items of electrical equipment as well as circuits in the service distribution and power distribution panel-boards; disconnect switches; disconnect switches; motor starting switches.
 - 2. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
 - 3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
 - a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
 - 4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
 - 5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
 - 6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.
- B. Identification Labels:
 - 1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
 - 1. Minimum Size: 1 inch by 2.5 inches.
 - 2. Legend:
 - a. Equipment designation or other approved description.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height:
 - a. Equipment Designation: 1/2 inch.
 - b. Other Information: 1/4 inch.
 - 5. Color:
 - a. Normal Power System: White text on black background.
- D. Format for Caution and Warning Messages:

1. Minimum Size: 2 inches by 4 inches.
 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 1/2 inch.
 5. Color: Black text on yellow background unless otherwise indicated.
- E. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
 2. Legend: Power source and circuit number or other designation indicated.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 3/16 inch.
 5. Color: Black text on clear background.
- F. Format for Control Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
 2. Legend: Load controlled or other designation indicated.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 3/16 inch.
 5. Color: Black text on clear background.

2.03 WIRE AND CABLE MARKERS

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

2.04 VOLTAGE MARKERS

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

2.05 UNDERGROUND WARNING TAPE

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.
- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color: Red

2.06 WARNING SIGNS AND LABELS

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

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 - 1. Surface-Mounted Equipment: Enclosure front.
 - 2. Flush-Mounted Equipment: Inside of equipment door.
 - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 - 4. Elevated Equipment: Legible from the floor or working platform.
 - 5. Branch Devices: Adjacent to device.
 - 6. Interior Components: Legible from the point of access.
 - 7. Conduits: Legible from the floor.
 - 8. Boxes: Outside face of cover.
 - 9. Conductors and Cables: Legible from the point of access.
 - 10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.
- G. Mark all handwritten text, where permitted, to be neat and legible.

3.02 FIELD QUALITY CONTROL

- A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION 26 0553

**SECTION 26 05 83
WIRING CONNECTIONS**

PART 1. GENERAL

1.1 SECTION INCLUDES

- A. Electrical connections to equipment.

1.2 REFERENCE STANDARDS

- A. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2020).
- B. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2021.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
 - 1. Colors: Comply with NEMA WD 1.
 - 2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.

3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 ELECTRICAL CONNECTIONS

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

END OF SECTION

SECTION 26 09 23
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Occupancy sensors.
- B. Daylighting controls.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- B. Section 26 05 33.16 - Boxes for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 27 26 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- D. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2015.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
 - 3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
 - 4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
 - 5. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
 - 1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.
- B. Shop Drawings:
 - 1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
 - 2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.
- C. Field Quality Control Reports.

- D. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Operation and Maintenance Data: Include detailed information on device programming and setup.
- F. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. Provide five year manufacturer warranty for all occupancy sensors.
- B. Provide five year manufacturer warranty for all daylighting controls.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

- A. All Occupancy Sensors:
 - 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
 - 2. Sensor Technology:
 - a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
 - b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
 - c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
 - 3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
 - 4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
 - 5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.

6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
 7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
 8. Sensitivity: Field adjustable.
 9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
 10. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above the selected level.
 11. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
 12. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on the drawings.
- B. Wall Switch Occupancy Sensors:
1. All Wall Switch Occupancy Sensors:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
 - b. Unless otherwise indicated or required to control the load indicated on the drawings, provide line voltage units with self-contained relay.
 - c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.
 - d. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
 - e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
- C. Wall Dimmer Occupancy Sensors:
1. General Requirements:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability, and no leakage current to load in off mode.
 - b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
 - c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
 - d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
 - e. Finish: Color to be selected.
- D. Ceiling Mounted Occupancy Sensors:
1. All Ceiling Mounted Occupancy Sensors:
 - a. Description: Low profile occupancy sensors designed for ceiling installation.
 - b. Unless otherwise indicated or required to control the load indicated on the drawings, provide low voltage units, for use with separate compatible accessory power packs.
 - c. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
 - d. Finish: White unless otherwise indicated.
 2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:

- a. Standard Range Sensors: Capable of detecting motion within an area of 1000 at a mounting height of 9 feet, with a field of view of 360 degrees.
- E. Power Packs for Low Voltage Occupancy Sensors:
 1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
 2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on the drawings.
 3. Input Supply Voltage: Dual rated for 120/277 V ac.
 4. Load Rating: As required to control the load indicated on the drawings.

2.03 DAYLIGHTING CONTROLS

- A. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of lighting control devices provided under this section.
 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switch Occupancy Sensors: 48 inches above finished floor.
 2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
 3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
- C. Install lighting control devices in accordance with manufacturer's instructions.
- D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- E. Install lighting control devices plumb and level, and held securely in place.

- F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 07 26.
- G. Provide required supports in accordance with Section 26 05 29.
- H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- I. Identify lighting control devices in accordance with Section 26 05 53.
- J. Occupancy Sensor Locations:
 - 1. Location Adjustments: Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.
 - 2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
- K. Daylighting Control Photo Sensor Locations:
 - 1. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
 - 2. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.
- L. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
- M. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.
- N. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.
- O. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.04 FIELD QUALITY CONTROL

- A. Inspect each lighting control device for damage and defects.
- B. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
- C. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.
- D. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
- C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
- D. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as

directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.
- B. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours of training.
 - 3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
 - 4. Location: At project site.

END OF SECTION 26 0923

**SECTION 26 22 00
LOW-VOLTAGE TRANSFORMERS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. K-factor transformers rated for nonlinear loads.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 33.13 - Conduit for Electrical Systems: Flexible conduit connections.

1.03 REFERENCE STANDARDS

- A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.
- B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.
- C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.
- F. NEMA ST 20 - Dry-Type Transformers for General Applications; 2014.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with placement of supports, anchors, etc. required for mounting.
 - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.
 - 1. Provide K 13-factor Rated Transformers on project
- C. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

PART 2 PRODUCT

2.01 MANUFACTURERS

- A. Eaton Corporation; www.eaton.com/#sle.
- B. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- C. Siemens Industry, Inc; www.usa.siemens.com/#sle.

2.02 TRANSFORMERS - GENERAL REQUIREMENTS

- A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.
- B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
 - 1. Altitude: Less than 3,300 feet (1,000 m).
 - 2. Ambient Temperature:
 - a. Greater than 10 kVA: Not exceeding 104 degrees F (40 degrees C).
 - b. Less than 10 kVA: Not exceeding 77 degrees F (25 degrees C).
- C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.
- D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.
- E. Basic Impulse Level: 10 kV.
- F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- G. Isolate core and coil from enclosure using vibration-absorbing mounts.
- H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.03 K-FACTOR TRANSFORMERS RATED FOR NONLINEAR LOADS

- A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 1561, and designed to supply nonlinear loads to the degree designated by the UL defined K-factor; ratings as indicated on the drawings.
- B. K-factor Rating: K-13, or higher.
- C. Insulation System and Allowable Average Winding Temperature Rise: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.
- D. Coil Conductors: Continuous copper windings with terminations brazed or welded. Individually insulate secondary conductors and arrange to minimize hysteresis and eddy current losses at harmonic frequencies. Size secondary neutral conductor at twice the secondary phase conductor ampacity.
- E. Winding Taps: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
- F. Neutral Bus: Sized to accommodate twice the rated secondary current.

- G. Energy Efficiency: Comply with 10 CFR 431, Subpart K.
- H. Sound Levels: Standard sound levels complying with NEMA ST 20.
- I. Mounting Provisions:
 - 1. Up to 75 kVA: Suitable for wall, floor, or trapeze mounting.
 - 2. Larger than 75 kVA: Suitable for floor mounting.
- J. Transformer Enclosure: Comply with NEMA ST 20.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor clean, dry locations: Type 2.
 - 2. Construction: Steel, ventilated.
 - 3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
 - 4. Provide lifting eyes or brackets.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.
- C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install transformers in accordance with NECA 409 and IEEE C57.94.
- D. Use flexible conduit, under the provisions of Section 26 05 33.13, 2 feet (600 mm) minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
- E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.
- F. Install transformers plumb and level.
- G. Transformer Support:
 - 1. Provide required support and attachment in accordance with Section 26 05 29, where not furnished by transformer manufacturer.
 - 2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.
 - 3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 30 00.
 - 4. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- H. Provide grounding and bonding in accordance with Section 26 05 26.
- I. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.
- J. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.

3.03 ADJUSTING

- A. Measure primary and secondary voltages and make appropriate tap adjustments.

- B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.04 CLEANING

- A. Clean dirt and debris from transformer components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 2200

**SECTION 262413
SWITCHBOARDS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.
- B. Overcurrent protective devices for switchboards.

1.02 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendment (2017).
- B. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- D. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.
- E. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- F. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.
- G. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 1000 Volts or Less; 2023.
- H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- K. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- L. UL 891 - Switchboards; Current Edition, Including All Revisions.
- M. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Service Entrance Switchboards:
 - 1. Coordinate with Utility Company to provide switchboards with suitable provisions for electrical service and utility metering, where applicable.
 - 2. Coordinate with Owner to arrange for Utility Company required access to equipment for installation and maintenance.
 - 3. Obtain Utility Company approval of switchboard prior to fabrication.

4. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.04 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.
- B. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 1. Include dimensioned plan and elevation views of switchboards and adjacent equipment with all required clearances indicated.
 2. Identify mounting conditions required for equipment seismic qualification.
- C. Manufacturer's equipment seismic qualification certification.
- D. Service Entrance Switchboards: Include documentation of Utility Company approval of switchboard.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Project Record Documents: Record actual installed locations of switchboards and final equipment settings.
- G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. Enclosure Keys: Two of each different key.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.
- B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.
- C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.07 FIELD CONDITIONS

- A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Switchboards - Basis of Design: _____.
- B. Switchboards:
 1. ABB/GE: www.electrification.us.abb.com/#sle.

2. Eaton Corporation: www.eaton.com/#sle.
3. Schneider Electric: www.se.com/#sle.
4. Siemens Industry, Inc: www.new.siemens.com/#sle.

2.02 SWITCHBOARDS

- A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.
- D. Service Entrance Switchboards:
 1. Listed and labeled as suitable for use as service equipment according to UL 869A.
 2. For solidly-grounded wye systems, provide factory-installed main bonding jumper between neutral and ground busses, and removable neutral disconnecting link for testing purposes.
 3. Comply with Utility Company requirements for electrical service.
 4. Utility Metering Provisions: Provide separate barriered compartment complying with Utility Company requirements where indicated or where required by Utility Company. Include hinged sealable door and provisions for Utility Company current transformers (CTs), potential transformers (PTs), or potential taps as required.
- E. Service Conditions:
 1. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
- F. Short Circuit Current Rating:
 1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
 2. Listed series ratings are not acceptable.
- G. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.
- H. Bussing: Sized in accordance with UL 891 temperature rise requirements.
 1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.
 2. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
 3. Phase and Neutral Bus Material: Copper.
 4. Ground Bus Material: Copper.
- I. Conductor Terminations: Suitable for use with the conductors to be installed.
 1. Line Conductor Terminations:
 - a. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - b. Main and Neutral Lug Type: Mechanical.
 2. Load Conductor Terminations:
 - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - b. Lug Type:
 - 1) Provide mechanical lugs.
- J. Enclosures:
 1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

- a. Indoor Clean, Dry Locations: Type 1 or Type 2 (drip-proof).
 - b. Outdoor Locations: Type 3R.
- 2. Finish: Manufacturer's standard unless otherwise indicated.
- 3. Outdoor Enclosures:
 - a. Color: Manufacturer's standard.
 - b. Access Doors: Lockable, with all locks keyed alike.
- K. Future Provisions:
 - 1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
 - 2. Equip distribution sections with full height vertical bussing to accommodate maximum utilization of space for devices.
 - 3. Where designated spaces for future device provisions are not indicated, include provisions for minimum of 6 device(s) rated at 25 percent of rating of switchboard main or incoming feed.
 - 4. Arrange and equip through bus and ground bus to accommodate future installation of additional switchboard sections where indicated.
- L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
 - 1. Where overcurrent protective devices equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
 - 2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.
 - a. Use zero sequence or residual ground fault detection method unless otherwise indicated.
 - b. Provide test panel and field-adjustable ground fault pick-up and delay settings.
- M. Arc Flash Energy-Reducing Maintenance Switching: For circuit breakers rated 1200 A or higher, provide a local accessory switch with status indicator light that permits selection of a maintenance mode with alternate electronic trip unit settings for reduced fault clearing time.
- N. Instrument Transformers:
 - 1. Comply with IEEE C57.13.
 - 2. Select suitable ratio, burden, and accuracy as required for connected devices.
 - 3. Current Transformers: Connect secondaries to shorting terminal blocks.
 - 4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

2.03 OVERCURRENT PROTECTIVE DEVICES

- A. Circuit Breakers:
 - 1. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 - 2. Molded Case Circuit Breakers:
 - a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 - 1) Provide thermal magnetic circuit breakers unless otherwise indicated.
 - 2) Provide electronic trip circuit breakers where indicated.
 - b. Minimum Interrupting Capacity:
 - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - 2) 14,000 rms symmetrical amperes at 480 VAC.

- c. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
- d. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
- e. Provide the following features and accessories where indicated or where required to complete installation:
 - 1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

2.04 SOURCE QUALITY CONTROL

- A. Factory test switchboards according to NEMA PB 2, including the following production (routine) tests on each switchboard assembly or component:
 - 1. Dielectric tests.
 - 2. Mechanical operation tests.
 - 3. Grounding of instrument transformer cases test.
 - 4. Electrical operation and control wiring tests, including polarity and sequence tests.
 - 5. Ground-fault sensing equipment test.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive switchboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.
- C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.
- D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch between switchboard and wall.
- E. Provide required support and attachment in accordance with Section .
- F. Install switchboards plumb and level.
- G. Provide grounding and bonding in accordance with Section 260526.
- H. Install all field-installed devices, components, and accessories.
- I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- J. Set field-adjustable circuit breaker tripping function settings as directed.
- K. Set field-adjustable ground fault protection pickup and time delay settings as directed.
- L. Provide filler plates to cover unused spaces in switchboards.

3.03 FIELD QUALITY CONTROL

- A. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.
- B. Inspect and test in accordance with NETA ATS, except Section 4.

- C. Perform inspections and tests listed in NETA ATS, Section 7.1.
- D. Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 200 amperes. Tests listed as optional are not required.
- E. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
 - 1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.
- F. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are .
- G. Test shunt trips to verify proper operation.
- H. Correct deficiencies and replace damaged or defective switchboards or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of switchboard covers and doors.

3.05 CLEANING

- A. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred surfaces to match original factory finish.

3.06 PROTECTION

- A. Protect installed switchboards from subsequent construction operations.

END OF SECTION

**SECTION 26 24 16
PANELBOARDS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Overcurrent protective devices for panelboards.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
 - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
- C. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- D. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Panelboard Keys: Two of each different key.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Eaton Corporation: www.eaton.com.
- B. General Electric Company: www.geindustrial.com.
- C. Schneider Electric; Square D Products: www.schneider-electric.us.
- D. Source Limitations: Furnish panelboards and associated components produced by the same manufacturers as the existing main switchboard and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended. Key all doors to Yale LL803.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet.
 - 2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
- C. Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
 - 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 - 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - 3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 - 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- J. Load centers are not acceptable.

2.03 POWER DISTRIBUTION PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and

features as indicated on the drawings. A. Provide the automatic circuit breaker type, quick-make and quick-break panelboards. Provide wiring gutter sides, top and bottom.

- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase and Neutral Bus Material: Copper.
 - 2. Ground Bus Material: Copper.
- D. Circuit Breakers:
 - 1. Provide bolt-on type.
 - 2. Provide thermal magnetic circuit breakers for circuit breaker frame sizes less than 225 amperes. AIC rating of not less than 10K. Circuit breaker to match same manufacturer as panelboard.
 - 3. Provide electronic trip circuit breakers for circuit breaker frame sizes 225 amperes and above.
- E. Enclosures:
 - 1. Provide surface-mounted or flush-mounted enclosures as indicated.
 - 2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
 - 3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
 - 2. Phase and Neutral Bus Material: Copper.
 - 3. Ground Bus Material: Copper.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated. Circuit breaker to match same manufacturer as panelboard.
- E. Enclosures:
 - 1. Provide surface-mounted or flush-mounted enclosures as indicated.
 - 2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
 - 3. Provide clear plastic circuit directory holder mounted on inside of door.

2.05 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:
 - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 - 2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - 2) 14,000 rms symmetrical amperes at 480 VAC.

- b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
- 3. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
- 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
- 5. Do not use tandem circuit breakers.
- 6. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required supports in accordance with Section 26 05 29.
- F. Install panelboards plumb.
- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- I. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- J. Provide grounding and bonding in accordance with Section 26 05 26.
- K. Install all field-installed branch devices, components, and accessories.
- L. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- M. Provide filler plates to cover unused spaces in panelboards.

3.03 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.
- C. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.

3.05 CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 2416

**SECTION 26 2726
WIRING DEVICES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Wall plates.
- E. Floor box service fittings.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 33.16 - Boxes for Electrical Systems.
- B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Revision H, 2014.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Revision G, 2014.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R2015).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- L. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
 - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
 - 4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
 - 5. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.
- B. Sequencing:
 - 1. Do not install wiring devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hubbell Incorporated: www.hubbell-wiring.com.
- B. Leviton Manufacturing Company, Inc: www.leviton.com.

2.02 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- D. Provide GFCI protection for receptacles installed within 6 feet of sinks.
- E. Provide GFCI protection for receptacles installed in kitchens.
- F. Provide GFCI protection for receptacles serving electric drinking fountains.
- G. Unless noted otherwise, do not use combination switch/receptacle devices.

2.03 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.
- C. Wiring Devices Installed for all switches, convenience outlets, telephone outlets and all other similar outlets, unless otherwise specified or noted in all areas: White with stainless steel wall face plate.
- D. Flush Floor Box Service Fittings: Gray wiring devices with aluminum cover and ring/flange.

2.04 WALL SWITCHES

- A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.05 WALL DIMMERS

- A. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

2.06 RECEPTACLES

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell-wiring.com.
 - 2. Leviton Manufacturing Company, Inc: www.leviton.com.
- B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
 2. NEMA configurations specified are according to NEMA WD 6.
- C. Convenience Receptacles:
1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
 2. Automatically Controlled Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; controlled receptacle marking on device face per NFPA 70; single or duplex as indicated on the drawings.
 3. Isolated Ground Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, with ground contacts isolated from mounting strap; isolated ground triangle mark on device face; single or duplex as indicated on the drawings.
- D. GFCI Receptacles:
1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
 2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
 3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
 - a. Products:
 - 1) 20 ampere, 2P 3-wire grounding type, 125 volt Hubbell #GF5362, installed in FS box with Hubbell #RCV1-GFR cover for roof mounted receptacles. All other weatherproof receptacles shall be mounted in a flush hinged door enclosure with lock and key. .
 - 2) Enclosure shall be P&S #4600-26 with a P&S #1591 receptacle or equal by C.W. Cole. .

2.07 WALL PLATES

- A. Manufacturers:
1. Hubbell Incorporated: www.hubbell-wiring.com.
 2. Leviton Manufacturing Company, Inc: www.leviton.com.
 3. Lutron Electronics Company, Inc: www.lutron.com.
 4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
- B. Wall Plates: Comply with UL 514D.
1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
 2. Size: Standard.
 3. Screws: Metal with slotted heads finished to match wall plate finish.
- C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- D. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- E. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.08 FLOOR BOX SERVICE FITTINGS

- A. Description: Service fittings compatible with floor boxes provided under Section 26 05 33.16 with components, adapters, and trims required for complete installation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.

- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.
 - 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switches: 48 inches above finished floor.
 - b. Receptacles: 18 inches above finished floor or 6 inches above counter.
 - 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
 - 3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
 - 4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
 - 5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.
- I. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- J. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.
- K. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- L. Install wall switches with OFF position down.
- M. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

- N. Do not share neutral conductor on branch circuits utilizing wall dimmers.
- O. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- P. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- Q. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- R. Identify wiring devices in accordance with Section 26 05 53.

3.04 FIELD QUALITY CONTROL

- A. Inspect each wiring device for damage and defects.
- B. Operate each wall switch with circuit energized to verify proper operation.
- C. Test each receptacle to verify operation and proper polarity.
- D. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- E. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 26 2726

**SECTION 26 2813
FUSES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fuses.

1.02 REFERENCE STANDARDS

- A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.
- D. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
 - 2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
 - 3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.04 SUBMITTALS

- A. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Bussmann, a division of Eaton Corporation: www.cooperindustries.com.

2.02 APPLICATIONS

- A. Individual Motor Branch Circuits: Class RK1, time-delay.

2.03 FUSES

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C. Provide fuses of the same type, rating, and manufacturer within the same switch.
- D. Comply with UL 248-1.
- E. Unless otherwise indicated, provide cartridge type fuses complying with [NEMA FU 1](#), Class and ratings as indicated.
- F. Voltage Rating: Suitable for circuit voltage.
- G. Class R Fuses: Comply with [UL 248-12](#).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment. D. Replace all fuses "blown" or damaged during construction with new fuses of proper rating and type for the particular use, replace spare sets.
- B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Do not install fuses until circuits are ready to be energized.
- B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION 26 2813

**SECTION 26 28 16.16
ENCLOSED SWITCHES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Enclosed safety switches.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 - 1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.
- C. Project Record Documents: Record actual locations of enclosed switches.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. 1.Westinghouse: Type HF or HU. 2.General Electric: Type TH. 3.Square D: Type HD or HU.
- B. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.
2. Ambient Temperature: Between -22 degrees F and 104 degrees F.
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
 2. Minimum Ratings:
 - a. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
- G. Provide with switch blade contact position that is visible when the cover is open.
- H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
 1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- I. Conductor Terminations: Suitable for use with the conductors to be installed.
- J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
- L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- M. Heavy Duty Switches:
 1. Comply with NEMA KS 1.
 2. Conductor Terminations:
 - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required supports in accordance with Section 26 05 29.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

- G. Provide grounding and bonding in accordance with Section 26 05 26.
- H. Provide fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

3.03 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- C. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 2816.16

SECTION 26 31 00 - 1
Photovoltaic Collectors

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Photovoltaic system requirements.
- B. Photovoltaic modules.
- C. Photovoltaic module mounting system.
- D. Photovoltaic combiner boxes.
- E. Photovoltaic inverters.
- F. Charge controllers.
- G. Monitoring system.

1.2 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

- A. IEC 61215-1 - Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 1: Test Requirements 2021 (Corrigendum).
- B. IEC 61215-1-1 - Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 1-1: Special Requirements for Testing of Crystalline Silicon Photovoltaic (PV) Modules 2021.
- C. IEC 61215-2 - Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 2: Test Procedures 2021.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- E. NECA 412 - Standard for Installing and Maintaining Photovoltaic (PV) Power Systems 2012.
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 1699B - Outline of Investigation for Photovoltaic (PV) DC Arc-Fault Circuit Protection; Current Edition Current Edition, Including All Revisions.
- I. UL 1703 - Flat Plate Photovoltaic Modules and Panels Current Edition, Including All Revisions.

- J. UL 1741 - Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for photovoltaic system components.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Roof-Mounted Arrays: Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

- A. NOT USED
- B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, details, and description of operation.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, outline and support point dimensions, finishes, weights, service condition requirements, and installed features.
- D. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, attachment locations and details, and proposed size, type, and routing of conduits and cables. Include system interconnection schematic diagrams showing all factory and field connections.
- E. Design Data:
 - 1. Include structural calculations, certified by structural engineer, for equipment and mounting system.
- F. Source quality control test reports.
- G. Field quality control test reports.
- H. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
- I. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Structural Designer Qualifications: Registered structural engineer licensed in the State in which the Project is located.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience with photovoltaic systems of similar size, type, and complexity.
 - 1. Licensed in the State in which the Project is located to install photovoltaic systems.
 - 2. Manufacturer's authorized installer.
 - 3. Supervisor: North American Board of Certified Energy Practitioners (NABCEP) certified PV Installer or three years experience supervising the installation of photovoltaic systems.
 - 4. Installer Personnel: At least 2 years of experience installing photovoltaic systems.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.8 WARRANTY

- A. Specified warranties indicate minimum requirements. Provide additional warranties or extended warranty periods where required to qualify for rebate and incentive programs.
- B. Photovoltaic Modules:
 - 1. Provide minimum five year manufacturer warranty covering repair or replacement due to defective materials or workmanship.
- C. Photovoltaic Module Mounting System: Provide minimum 10 year manufacturer warranty covering repair or replacement due to defective materials or workmanship.
- D. Photovoltaic Inverters: Provide minimum five year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Photovoltaic Modules, Crystalline Silicon:
 - 1. Kyocera Solar, Inc;
 - 2. SolarWorld Americas;

- 3. SunPower.
- B. Photovoltaic Module Mounting System:
 - 1. Cooper B-Line, a division of Cooper Industries;
 - 2. Direct Power and Water Corporation;
 - 3. PHP Systems/Design;
- C. Photovoltaic Combiner Boxes:
 - 1. SMA America, LLC;
 - 2. SolarBOS, Inc;
 - 3. Solectria Renewables, LLC;
- D. Photovoltaic Inverters:
 - 1. Schneider Electric;
 - 2. SMA America, LLC;
 - 3. Solectria Renewables, LLC;
- E. Charge Controllers:
 - 1. Outback Power Technologies, Inc;
 - 2. Schneider Electric;
- F. Monitoring System:
 - 1. Schneider Electric;
 - 2. SMA America, LLC;
 - 3. Solectria Renewables, LLC;
- G. Source Limitations: For each type of component, furnish products produced by a single manufacturer and obtained from a single supplier.

2.2 PHOTOVOLTAIC SYSTEM REQUIREMENTS

- A. Provide complete photovoltaic system consisting of photovoltaic modules and associated balance of system components necessary for connection to facility electrical system.
- B. System Description:
 - 1. Photovoltaic array is roof-mounted in location indicated on the drawings.
 - 2. System includes battery storage system.
 - 3. System includes monitoring system.

- C. Size:
 - 1. Array: Designed to fit within the area designated on the drawings.
- D. Appearance:
 - 1. Arrange array such that modules are aligned with uniform spacing.
 - 2. Make no alterations affecting appearance of building exterior or interior without approval of Architect.
 - 3. Final determination of acceptable appearance is by Architect.
- E. Fire Resistance Rating: Provide photovoltaic module and mounting system combination that together with the roof covering form a system listed in accordance with UL 1703 to provide a fire rating equal to or better than the required fire rating of the roof.
- F. Provide photovoltaic system and associated components suitable for wind loads, snow loads, seismic loads, and other structural design considerations of the installed location.
- G. Provide photovoltaic system and associated components suitable for continuous operation under the service conditions at the installed location.
- H. Provide products listed, classified, and labeled as suitable for the purpose intended.
- I. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system.
- J. DC Arc Fault Circuit Protection: Provide DC photovoltaic arc-fault protection devices listed as complying with UL 1699B as required for compliance with NFPA 70.
- K. Rapid Shutdown of Photovoltaic Systems on Buildings: Provide listed equipment arranged to provide rapid shutdown in accordance with NFPA 70.
- L. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- M. Arrange array to minimize shading during peak production periods.
- N. Roof-Mounted Arrays:
 - 1. Arrange array such that normal roof drainage is not affected.
 - 2. Arrange array to maintain required safety clearances from edges of roof as indicated.
 - 3. Arrange array to maintain access and clearance requirements for other roof-mounted equipment.
 - 4. Arrange array to avoid spanning of expansion joints.

2.3 PHOTOVOLTAIC MODULES

- A. Acceptable Module Types: Either crystalline silicon or thin film modules complying with specified requirements will be considered for this project.
- B. General Requirements:
 - 1. Photovoltaic Modules: Factory assembled; consisting of photovoltaic cells, frame, junction box, cables for series connection, and bypass diodes for shade tolerance; rated for 600 V DC; complying with IEC 61215-1 and IEC 61215-2 and listed as complying with UL 1703.
 - 2. Crystalline Silicon Photovoltaic Modules: Comply with IEC 61215-1-1.
 - 3. Frame: Anodized aluminum.
 - 4. Factory-Installed Junction Box: Weatherproof, with factory-installed terminals and bypass diodes.
 - 5. Factory-Installed Cables: Type USE-2 or listed photovoltaic (PV) wire with polarized locking connectors.
 - 6. Unless otherwise indicated, specified module performance characteristics are rated under Standard Test Conditions (STC).

2.4 BALANCE OF SYSTEM COMPONENTS

- A. Photovoltaic Module Mounting System:
 - 1. Provide complete mounting system compatible with modules to be installed and suitable to properly install them in the location indicated, including all necessary hardware and accessories.
 - 2. Support Structure and Associated Hardware Materials: Use aluminum or stainless steel.
 - 3. Roof-Mounted Arrays:
 - a. Provide system compatible with the roof at the installed location.
 - b. Module Tilt Angle: As required to provide maximum energy production for installed location.
 - c. Provide minimum clearance of 3 inches between roof and module for air circulation and drainage.
- B. Photovoltaic Combiner Boxes:
 - 1. Provide combiner box(es) for termination of strings as indicated or as required for the array configuration installed.
 - 2. Combiner Boxes: Rated for 600 V DC; current ratings suitable for connected strings; equipped with fuseholders; listed as complying with UL 1741.
 - 3. Fuseholders: Touch-safe; suitable to accept fuses indicated.

4. Number of Input Circuits: As indicated or as required for termination of strings, with minimum of 25 percent spare capacity for future expansion.
5. Enclosure: NEMA 250, Type 3R, unless otherwise indicated.

C. Photovoltaic Inverters:

1. Provide inverter(s) as indicated or as required for connection of the photovoltaic array DC system to the AC system indicated.
2. Inverters: Suitable for the requirements of the connected array; output configuration compatible with connected system; listed as complying with UL 1741; furnished with the following features:
 - a. Maximum power point tracking (MPPT).
 - b. LCD display.
3. Total Harmonic Distortion: Less than five percent.
4. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

D. Monitoring System:

1. Provide a system to monitor photovoltaic system performance including all sensors, dataloggers, connections, software, equipment and accessories necessary for a complete operating system.
2. System communications interfaces to be wired or wireless, with compatible interconnected components.
 - a. Provide suitable raceway, minimum 3/4 inch trade size, for all required wired connections.
3. System to monitor and record, in 15 minute intervals:
 - a. Inverter status.
 - b. Instantaneous power (kW).
 - c. Cumulative energy production (kWh).
4. System real-time and historical data to be accessible from the following locations:

2.5 SOURCE QUALITY CONTROL

- A. Factory test the following products to verify operation and performance characteristics. Include test reports with submittals.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that ratings and configurations of system components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive system components.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

- A. Use open circuiting, short circuiting, or opaque covering to disable modules, array or portions of array prior to installation and service.
- B. Roof-Mounted Arrays: Protect roof and adjacent roof-mounted items from damage.

3.3 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Mount equipment such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor, ground, or working platform.
- D. Circuiting Requirements. in Addition to Requirements of Section 260519:
 - 1. Wiring Methods:
 - a. Unless otherwise indicated, use exposed module factory-installed cables (not routed inside building) for module interconnections.
 - b. Secure exposed cables in accordance with NFPA 70. Where possible, conceal behind array.
 - 2. Photovoltaic DC System Conductor Color Code:
 - a. Negative Grounded System:
 - 1) Positive: Red.
 - 2) Negative/Grounded: White.
 - b. Positive Grounded System:
 - 1) Positive/Grounded: White.
 - 2) Negative: Black.
 - c. Ungrounded System:
 - 1) Positive: Red.
 - 2) Negative: Black.

3. Maintain separation of photovoltaic and non-photovoltaic circuits in accordance with NFPA 70.
- E. Grounding and Bonding Requirements, in Addition to Requirements of Section 260526:
1. Ensure that there is only one AC System bonding connection between grounding system and grounded/neutral conductor, including external connections and connections internal to equipment.
- F. Identification Requirements, in Addition to Those Specified in Section 260553:
1. Use identification nameplate or means of identification acceptable to authority having jurisdiction to identify the presence of multiple power sources and the location of main service disconnecting means and each photovoltaic system disconnecting means. Locate at main service disconnecting means and at each photovoltaic system disconnecting means. Verify format and descriptions with authorities having jurisdiction.
 2. Use identification nameplate to identify each photovoltaic system disconnecting means with text "PV SYSTEM DISCONNECT".
 3. Use identification nameplate or identification label to identify systems equipped with rapid shutdown and associated rapid shutdown switch(es). Format, descriptions, and locations to comply with NFPA 70 and requirements of authorities having jurisdiction.
 4. Use identification nameplate or identification label to identify the information required by NFPA 70 for marking of direct-current photovoltaic power sources. Locate at each DC disconnect means requiring marking.
 5. Use identification nameplate or identification label to identify the interactive system point of interconnection at the disconnecting means as a power source and with the rated AC output current and the nominal operating AC voltage.
 6. Use warning labels to identify electrical hazards for photovoltaic system disconnecting means. Include the word message "Warning - Electric Shock Hazard; Terminals on the line and load sides may be energized in the open position" or approved equivalent.
 7. Use wire and cable markers to identify photovoltaic system source, output, and inverter circuit conductors at all points of termination, connection, and splices.
 8. Use voltage markers, identification labels, stenciled text, or suitable permanent marking approved by authority having jurisdiction to identify exposed raceways, cable trays, pull boxes, junction boxes, and conduit bodies with the text "Warning: Photovoltaic Power Source" at maximum intervals of 10 feet in accordance with NFPA 70.

3.4 FIELD QUALITY CONTROL

- A. See article "SYSTEM STARTUP" below for additional requirements related to testing and inspection.
- B. Inspection and testing to include, at a minimum:
1. Inspect each system component for damage and defects.

2. Verify that equipment enclosures, boxes, and associated connections installed outdoors are weatherproof.
 3. Verify proper wiring connections have been made and check for conductor continuity. Verify proper polarity.
 4. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
 5. Measure and record voltages at the inverter AC and DC inputs.
 6. Measure and record AC output power.
 7. Perform inverter functional test.
 8. Verify proper operation of monitoring system.
- C. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.
- D. Submit detailed reports indicating inspection and testing results and corrective actions taken.
- E. Repair roof or adjacent roof-mounted items damaged as a result of work of this section.

3.5 SYSTEM STARTUP

- A. Obtain Owner's approval prior to performing system startup.
- B. Grid-Tied Systems: Obtain Utility Company's approval prior to performing system startup.
- C. Prepare and start system in accordance with manufacturer's instructions.

3.6 CLEANING

- A. Clean modules using only methods recommended by manufacturer to avoid scratches and other damage. Clean exposed surfaces on other components to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.
- B. Training: Train Owner's personnel on operation, adjustment, and maintenance of photovoltaic system.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 2. Provide minimum of four hours of training.

3.8 PROTECTION

- A. Protect installed products from subsequent construction operations.

3.9 MAINTENANCE

- A. Conduct site visit at least once every six months to perform inspection, testing, and preventive maintenance. Conduct tests similar to those made during original field quality control testing. Submit report to Owner comparing test results with those of original tests along with evaluations and recommendations.
- B. Provide trouble call-back service upon notification by Owner:
 - 1. Include allowance for call-back service during normal working hours at no extra cost to Owner.
 - 2. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

END OF SECTION

**SECTION 263110
BATTERY ENERGY STORAGE SYSTEMS (BESS)**

PART 1 - GENERAL

1.01 SUMMARY

- A. This specification covers requirements for the design, installation, and commissioning Battery Energy Storage Systems (BESS), including equipment, accessories, controls, wiring, testing, and commissioning necessary to provide a complete, safe, and functional system.
- B. Work, material or equipment shall comply with the codes, industry standards, and applicable ordinances and regulations of the local government having jurisdiction, including the regulations of serving utilities and any participating agencies having jurisdiction.
- C. Codes and Applicable standards: Products and installation shall meet or exceed the latest edition of the following standards.
 - 1. ADA – Americans with Disabilities Act (ADA).
 - 2. ANSI/NEMA 250 Enclosure for Electrical Equipment (1000 Volts Maximum).
 - 3. ANSI/UL 1741 – Standard For Inverters, Converters, Controllers And Interconnection System Equipment For Use With Distributed Energy Resources.
 - 4. ANSI/UL 1973 – Standard For Batteries For Use In Light Electric Rail (LER) Applications And Stationary Applications.
 - 5. ANSI/UL 2900-1 – Standard for Software Cybersecurity for Network-Connectable Products, Part1: General Requirements.
 - 6. ANSI/UL 2900-2-3 – Mitigation of Cybersecurity Risk.
 - 7. ANSI/UL 9540 – Standard For Test Method For Evaluating Thermal Runaway Fire Propagation In Battery Energy Storage Systems.
 - 8. California Building Code (CBC).
 - 9. California Electrical Code (CEC).
 - 10. California Green Building Code. (CalGreen).
 - 11. California Publics Utility Commission – Rule 21 and Net Energy Meeting Rules.
 - 12. Department of Energy, Energy Act.
 - 13. IEC 62619 – Safety and Performance Testing of Secondary Batteries used in Energy Storage Systems.
 - 14. IEEE C2 – National Electrical Safety Code.
 - 15. IEEE 1100 – Recommended Practice for Powering and Grounding Sensitive Electronic Equipment.
 - 16. IEEE 1547 – Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces.
 - 17. IEEE 2030.2.1 – Guide for Design, Operation, and Maintenance of Battery Energy Storage Systems, both Stationary and Mobile, and Applications Integrated with Electric Power Systems.
 - 18. IEEE 2030.2 – Guide for the Interoperability of Energy Storage Systems Integrated with the Electric Power Infrastructure.
 - 19. International Electrical Code adopted by the State of California.
 - 20. ISO 15118 – Energy, Transportation Technology, Health and Safety.
 - 21. ISO 27001 – Standards for Information Security Management Systems.
 - 22. ISO 50001 – Energy Management Systems.
 - 23. NFPA 855 – Standard for the Installation of Stationary Energy Storage Systems.
 - 24. UN 38.3 – Safe Transport of Lithium Ion Batteries
 - 25. UL 62109-1 - Safety of power converters for use in photovoltaic power systems – Part 1: General requirements.
 - 26. UL 1642 – Standard for Lithium Batteries.

- D. No requirement of these specifications and construction drawings shall be construed to void any of the provisions of the above standards. The CONTRACTOR Shall bring to the attention of the OWNER any conflicts or changes required to the contract documents in order to obtain compliance with applicable codes and standards.
- E. ACRONYMS
 - 1. American National Standards Institute
 - 2. Architect of Record
 - 3. California Electrical Code
 - 4. Engineer of Record
 - 5. International Building Code
 - 6. Institute of Electrical and Electronics Engineers
 - 7. International Organization for Standardization
 - 8. National Electrical Code
 - 9. National Electrical manufacturers Association
 - 10. Underwriters Laboratory

1.02 SUBMITTALS

- A. Provide submittals in accordance with Division 01.
- B. Shop Drawings: BESS equipment data sheets and manufacturer's technical specifications that clearly indicate make and model, catalog number, dimensions, weight, voltage, kVA and kW ratings, batteries kWh discharge and charging rates, amperage, finish, type of batteries, battery management system features and technical data, battery chemistry, insulation class, design and operating temperature range, sound levels, efficiency, enclosure IP and NEMA rating and corrosion resistance, seismic zone approval rating, listing of all accessories, installation instructions and testing procedures, maintenance manual, communication interface and communication protocols.
- C. Submit one copy for each set of shop drawings.
- D. Provide manufacturers data for all major components.
- E. Provide full connection schematic and wiring diagrams, and single line diagram.
- F. Provide copies of required test reports and manufacturer's certification of compliance with applicable standards and codes.
- G. Provide installers certifications for the implementation of BESS.
- H. Provide a commissioning plan, testing procedures, sequence of operations.
- I. Provide a list of replacement parts.
- J. Provide test reports and/or certificates of compliance with industry standards listed in 1.01.D.

1.03 SUBSTITUTIONS

- A. Substitutions shall comply with limitations set forth in division 01 2513. In addition, the following information shall be submitted:
 - 1. Substitution request shall be accompanied with a comparison chart and substantiating evidence to show proof of compliance of the proposed product with the BESS characteristics and features indicated herein.

1.04 QUALITY ASSURANCE

- A. The specifications represent the minimum acceptable performance criteria.
- B. Provide BESS from a manufacturer with a minimum of seven-years of experience in designing and manufacturing battery energy storage systems of the kind specified.
- C. The BESS shall be certified to comply with the applicable codes, industry standards, utility company, and federal and state applicable regulations.

- D. BESS shall be California Energy Commission listed per California Code of Regulations, Title 20.
- E. Installation shall be performed with BESS certified integrators/installers. Provide certificate as part of the submittal process.
- F. BESS shall be listed and approved for the intended application by Underwriter's Laboratories (UL), or other Nationally Recognized Testing Laboratory (NRTL), and in compliance with applicable industry standards and codes, including those mentioned under article 1.01.D.
- G. Provide manufacturer's test reports of BESS supply equipment.
- H. Proposed products shall have been in the market for a minimum of seven-years,
- I. Provide all labor, engineering, design, testing, supervision, material and equipment required.
- J. BESS and related equipment shall be delivered to the site in the manufacturer's original packaging, labeled with the manufacturer's name, model number, and electrical specifications.
- K. All equipment and materials shall be new.
- L. Integrator shall have an established communication mechanism for providing support to OWNER.

1.05 COMMISSIONING

- A. Commissioning shall be provided in accordance with Division 01- General Conditions.
- B. CONTRACTOR shall provide a copy of fully completed and verified BESS manufacturer's start-up tests, and provide prefunctional and functional test reports for OWNER's Commissioning Services Provider (CxSP) review. Pre-functional and functional tests shall be performed in the presence of the CxSP and DSA Inspectors.
- C. CONTRACTOR shall commission the BESS and provide a commissioning report that documents BESS performance during normal grid-tied operations, and during grid failure.
- D. CONTRACTOR shall provide all tools and personnel, and perform start-up, and prefunctional and functional performance testing in the presence of the OWNER, the CxSP, and Project Inspector.
- E. CONTRACTOR shall provide a certificate of installation and functionality.
- F. CONTRACTOR shall deliver required training in the presence of the CxSP.

1.06 TRAINING

- A. Provide (2) four-hours hands-on training sessions to OWNER's Maintenance and Operations personnel. Training shall include:
 - 1. BESS description, features, and operation.
 - 2. Demonstration on routine testing and maintenance operations, and instruction on all items included in the maintenance and operations manual.
 - 3. Safety criteria, protection, and emergency response operations.
 - 4. Programming features and firmware reprogramming.
 - 5. Load shading, peak load management, demand response, net metering and net tariff response features, and behind the meter services.
 - 6. System status, monitoring, and alarm features.
 - 7. Emergency response and risks mitigation strategies.
 - 8. Hazardous chemical recycling and disposal procedures and requirements for compliance with state and authorities having jurisdiction
 - 9. Recommendations and lessons learned from previous projects.
 - 10. Maintenance and operation plan.

1.07 WARRANTY

- A. Provide a one-year labor warranty.

- B. BESS shall be warranted to be free from defects in materials and fabrication for a period of ten-years from the date of substantial completion.
- C. Warranty shall be all inclusive. Exclusions for third party components are not acceptable.

PART 2 – PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Provide a BESS system per plans behind-the-meter Lithium-ion BESS. CONTRACTOR shall provide all labor, material, equipment, engineering, programming, testing and studies required to design, install, and commission a fully functional and tested all-inclusive and interconnected BESS system to peripheral equipment and components, sites power distribution system, photovoltaic system, and to utility company.
- B. BESS voltage shall be per plans with a frequency of 60 Hertz or as otherwise indicated on drawings.
- C. CONTRACTOR shall provide test reports, certificates of compliance, and/or certifications to substantiate compliance with the applicable industry standards.
- D. Grid Code Compliance: BESS shall comply with the requirements listed in IEEE 1547 – Standards for Distributed Energy.
- E. CONTRACTOR shall verify compliance with California Public Utilities interactive photovoltaic and BESS systems integration. Refer CPU Rule 21 for additional requirements.
- F. Refer to Article 1.01. for a list of applicable codes and industry standards.
- G. The BESS, and associated equipment, shall be provided in self-contained National Electrical Manufacturers Association (NEMA) enclosure(s) rated for the site conditions.
 - 1. The use of cargo containers is restricted and not acceptable for the BESS.
 - 2. Provide complete structural design and construction documentation in compliance with the requirements of ASCE 7, section 13.1.5. Refer to DSA IR N-4 – Modular Battery Energy Storage Systems for additional requirements.

2.02 BESS TECHNICAL REQUIREMENTS

- A. The BESS shall meet the following system performance and technical parameters:
 - 1. The BESS controller shall be as a minimum 30% larger than the BESS power rating. The system controller shall provide all features required to perform the minimum technical requirements listed in these specifications.
 - 2. Individual or grouped BESS shall not exceed 600 kilowatt hours (kWh) and shall meet the fire suppression requirements listed under the applicable California Fire Code.
 - 3. Battery Type shall be Lithium-Ion with efficiency >90%
 - 4. Nominal Capacity as indicated on drawings.
 - 5. Round-Trip Efficiency shall be ≥85%.
 - 6. Provide a system with a response Time ≤10 Seconds.
 - 7. System's lifetime and Cycling shall be 20,000 lifetime cycles and 1 or 2 cycles per day.
 - 8. The system shall be designed for high tolerance to power spikes.
 - 9. The system's voltage and current detection accuracy shall be +/-0.5%.
 - 10. Voltage Range shall be 100-1000V.
 - 11. The BESS shall provide for a voltage sampling period ≤100ms.
 - 12. Current Range: as indicated on drawings.
 - 13. The systems shall be listed for a frequency regulation nominal value of 60 Hz.
 - 14. Regulating power sub-second response times shall be <10 seconds.
 - 15. The BESS system shall be integrated/ work in conjunction with solar photovoltaic systems.
 - 16. The system shall monitor and be capable of responding to peak shaving monitoring, backup power status, peak-time charge/ load leveling /time of use, load shaving, demand response/ demand charge, loads segregation, and net billing, and establish and monitor the systems power quality.

17. The system shall be provided with protection devices integrated into the cells, modules, and battery systems to prevent accidents – typical devices include but are not limited to current interrupt devices, (CIDs), positive temperature coefficient (PTC), thermistors, current-limiting fuses, diodes, battery management systems (BMSs), etc. Controls for occurrence and intensity of heat and gas.
18. BESS shall be provided with a fire suppression system suitable for the battery and chemicals in the BESS, and in compliance with CFC requirements.
19. The system shall be capable of communicating via Ethernet, RS485, Open ADR, and HMI.
20. The system shall be equipped with a monitoring system that provides operations status, data management, alarms and reports. The monitoring system shall include features to limit or correct overcharging, over-discharging, excess current, or short circuits.
21. System shall be provided with protection devices integrated into the cells, modules, and battery systems to prevent accidents – typical devices include but are not limited to current interrupt devices, (CIDs), positive temperature coefficient (PTC), thermistors, current-limiting fuses, diodes, battery management systems (BMSs), etc. Controls for occurrence and intensity of heat and gas.
22. The system shall be capable of communicating via Ethernet, RS485, and Open ADR and HMI.

2.03 ENVIRONMENTAL MANAGEMENT

- A. Provide vegetation abatement as necessary, waste/garbage clean surroundings, and provide a battery, chemical disposal, and waste management procedures.

2.04 SAFETY MANAGEMENT

- A. Provide adequate protection of the BESS facility against criminal acts such as vandalism, theft, and trespassing.
- B. The controller shall include protection mechanisms against overcharging, over-discharging, overheating, short circuits, and other potential hazards.
- C. Verify and provide reports that state compliance with relevant safety standards and certifications.
- D. Test and inspection shall comply with CBC Chapter 17A and California Administrative Code (CAC).
- E. Provide a completed and approved DSA form 103 – List of Required Structural Tests and Special Inspections.

2.05 SPARE PARTS

- A. System shall be equipped with sufficient storage area for on-site spares parts.
- B. Provide spare parts per manufacturer's recommendations.

2.06 RECYCLING AND DISPOSSAL

- A. CONTRACTOR shall follow the manufacturer's instructions, local regulations, and authorities having jurisdiction for toxic and hazardous materials disposal and recycling.
- B. Hazardous chemical components, such as batteries shall be removed from the system and dispose of in a safe, environmentally friendly manner. This may involve recycling the battery or taking it to a specialized disposal facility. Coordinate with LAUSD Office of Environmental Health and Safety (OEHS) prior to disposal and abatements.
- C. CONTRACTOR shall ensure that any hazardous or toxic materials are handled in accordance with jurisdictional and OEHS guidelines.

2.07 EQUIPMENT

- A. Approved Manufacturers: BESS systems from Fortress Power, ABB, and Hitachi that comply with the requirements of this specification, or OWNER approved equal.

PART 3 - EXECUTION

3.01 DELIVERY AND STORAGE

- A. Deliver, storage, protect and handle products in accordance with the manufacturer's recommendations.
- B. BESS shall be stored in a dry, clean, and protected area to keep units from damage and theft until installation.
- C. Where field applied painting of enclosures is required to correct damage to the manufacturer's factory applied coatings, provide manufacturer's recommended coatings and apply in accordance with manufacturer's instructions.

3.02 INSTALLATION

- A. BESS shall be mounted on concrete pads, unless noted otherwise in the construction documents. Slab and pads shall be constructed to meet OWNER standards and DSA requirements. Refer to specification section 03 3000 – Cast-in-Place Concrete.
- B. Comply with CBC seismic requirements.
 - 1. The underground duct bank shall be per OWNER standards.
- C. BESS shall be effectively grounded.
- D. Coordinate and obtain approval from California State Fire Marshall.

3.03 TESTING

- A. Provide instruments and accessories required to perform checks. Voltmeters, Amp meters, etc., shall be accurate within .075 percent or one percent and shall have scales permitting voltage readings to be performed on upper half of scale.
- B. Test meters and ammeter calibration: Calibration shall comply ISO/IEC 17025.
- C. Properly document the testing procedures, results, and any observed issues or anomalies. Prepare a comprehensive test report detailing the testing methodology, test setup, results, and recommendations for improvements or further actions.
- D. Test emergency shutdown procedures, fire suppression systems, and ensure compliance with relevant safety standards.
- E. Evaluate the performance and efficiency of the BESS under different operational conditions. Perform the following tests and provide test results.
 - 1. Test the BESS's integration with the electrical grid and the application it is designed for. Assess the compatibility of the BESS with the grid voltage, frequency and capacity regulations, and power quality requirements. Verify the system's ability to provide grid support services such as frequency regulation, voltage control, power and time of use, peak shaving, self-consumption and net-billing, grid demand response, back-up power. frequency, voltage, charging time, and capacity regulation.
 - 2. Test anchorage, alignment, and grounding.
 - 3. Test the energy management and control system of the BESS. Test the functionality of the control algorithms, monitoring systems, and communication interfaces. Ensure that the BESS can accurately monitor, control, and optimize energy flows based on system requirements and grid conditions.
 - 4. Evaluate the cycling capability and long-term performance of the BESS. Perform cycling tests to simulate real-world charge and discharge cycles over the expected lifetime of the system. This helps assess the durability of the battery cells, degradation rates, and overall battery life.
 - 5. Perform resistance measurements through all bolted connections with low-resistance ohmmeter.
 - 6. Verify operation of alarms and systems response, and pilot signal detection and verification.

- a. Check ground fault circuit interrupt response.
 - b. Check systems current limit.
 - c. Check and verify Electronic Data Interface and data transmission.
- F. Test the energy storage capacity, charge/discharge rates, round-trip efficiency, response time, and overall system efficiency.
- G. Conduct fault and failure testing to evaluate the BESS's resilience and response to abnormal conditions. Simulate and test various failure scenarios such as component failures, grid disturbances, or other appropriate external events to ensure the system can safely operate and recover from such situations.
- H. Measure and verify the BESS's ability to meet the specified performance requirements.
 - 1. Visual and Mechanical Inspection:
 - 2. CONTRACTOR shall verify the equipment nameplate data with specifications and approved shop drawings.
 - 3. Inspect physical and mechanical condition. Check for damage. Damaged equipment shall not be acceptable.
 - 4. Inspect anchorage, alignment, and grounding.
 - 5. Perform specific inspections and mechanical tests as recommended by manufacturer.
- I. Environmental Impact:
 - 1. Test the noise levels at a distance of 5 feet from the BESS enclosure. Noise level shall not exceed the allowed maximum dBA levels for school facilities environments.
 - 2. Test the thermal management system effectiveness, and any potential risks associated with the battery chemistry, such as fire or chemical leakage.

3.04 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.05 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off Project site.
- B. Repair scratched or marred surfaces affected during the execution of work. Repair surfaces shall match original finish.

END OF SECTION

**SECTION 263213
ENGINE GENERATORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Packaged engine generator system and associated components and accessories:
 - 1. Engine and engine accessory equipment.
 - 2. Alternator (generator).
 - 3. Generator set control system.
 - 4. Generator set enclosure.

1.02 RELATED REQUIREMENTS

- A. Section 231113 - Facility Fuel-Oil Piping:
 - 1. Diesel fuel piping.
- B. Section 235100 - Breechings, Chimneys, and Stacks: Engine exhaust piping.
 - 1. Includes installation of exhaust silencer specified in this section.
- C. Section 260526 - Grounding and Bonding for Electrical Systems.
- D. Section 260529 - Hangers and Supports for Electrical Systems.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. ASTM D975 - Standard Specification for Diesel Fuel; 2024a.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NECA/EGSA 404 - Standard for Installing Generator Sets; 2014.
- D. NEMA MG 00001 - Motors and Generators; 2024.
- E. NFPA 30 - Flammable and Combustible Liquids Code; 2024, with Amendment.
- F. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines; 2021.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 99 - Health Care Facilities Code; 2024, with Errata.
- I. NFPA 110 - Standard for Emergency and Standby Power Systems; 2022.
- J. UL 142 - Steel Aboveground Tanks for Flammable and Combustible Liquids; Current Edition, Including All Revisions.
- K. UL 2200 - Stationary Engine Generator Assemblies; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.
 - 2. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition

requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.

1. Include generator set sound level test data.
- B. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.
 1. Identify mounting conditions required for equipment seismic qualification.
- C. Manufacturer's equipment seismic qualification certification.
- D. Derating Calculations: Indicate ratings adjusted for applicable service conditions.
- E. Fuel Storage Tank Calculations: Indicate maximum running time for generator set configuration provided.
- F. Specimen Warranty: Submit sample of manufacturer's warranty.
- G. Evidence of qualifications for installer.
- H. Manufacturer's factory emissions certification.
- I. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.
- J. Maintenance contracts.
- K. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.
- L. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. Extra Filter Elements: One of each type, including fuel, oil and air.

1.06 QUALITY ASSURANCE

- A. Comply with the following:
 1. NFPA 70 (National Electrical Code).
 2. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).
 3. NFPA 30 (Flammable and Combustible Liquids Code).
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with engine generator systems of similar size, type, and complexity; manufacturer's authorized installer.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store generator sets in accordance with manufacturer's instructions and NECA/EGSA 404.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's instructions to avoid damage to generator set components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. Provide minimum five year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Packaged Engine Generator Set:
 - 1. Caterpillar Inc: www.cat.com/#sle.
 - 2. Cummins Power Generation Inc: www.cumminspower.com/#sle.

2.02 PACKAGED ENGINE GENERATOR SYSTEM

- A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. System Description:
 - 1. Application: Emergency/standby.
 - 2. Configuration: Single packaged engine generator set operated independently (not in parallel).
- D. Packaged Engine Generator Set:
 - 1. Type: Diesel (compression ignition).
 - 2. Power Rating: As indicated on drawings, standby.
 - 3. Voltage: As indicated on drawings.
 - 4. Main Line Circuit Breaker:
 - a. Type: Thermal magnetic.
 - b. Trip Rating: As indicated on drawings.
- E. Generator Set General Requirements:
 - 1. Prototype tested in accordance with NFPA 110 for Level 1 systems.
 - 2. Factory-assembled, with components mounted on suitable base.
 - 3. List and label engine generator assembly as complying with UL 2200.
 - 4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
 - 5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
 - 6. Main Line Circuit Breakers: Provide factory-installed line side connections with suitable lugs for load side connections.
- F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.
- G. Starting and Load Acceptance Requirements:
 - 1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.
 - 2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.
 - 3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
 - 4. Maximum Load Step: Supports 100 percent of rated load in one step.
- H. Exhaust Emissions Requirements:
 - 1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.
 - 2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.
- I. Sound Level Requirements:

1. Do not exceed 55 dBA when measured at 23 feet from generator set in free field (no sound barriers) while operating at full load; include manufacturer's sound data with submittals.

2.03 ENGINE AND ENGINE ACCESSORY EQUIPMENT

- A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.
- B. Engine Fuel System - Diesel (Compression Ignition):
 1. Fuel Source: Diesel, ASTM D975 No. 2-D or approved cold weather diesel blends.
 2. Fuel Storage: Sub-base fuel tank.
 3. Engine Fuel Supply: Provide engine-driven, positive displacement fuel pump with replaceable fuel filter(s), water separator, check valve to secure prime, manual fuel priming pump, and relief-bypass valve. Provide fuel cooler where recommended by manufacturer.
 4. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.
 5. Sub-Base Fuel Tank:
 - a. Provide sub-base mounted, double-wall fuel tank with secondary containment; listed and labeled as complying with UL 142.
 - b. Tank Capacity: Size for minimum of 48 hours of continuous engine generator operation at 100 percent rated load, but not larger than permissible by applicable codes.
 - c. Features:
 - 1) Direct reading fuel level gauge.
 - 2) Normal atmospheric vent.
 - 3) Emergency pressure relief vent.
 - 4) Fuel fill opening with lockable cap.
 - 5) Dedicated electrical conduit stub-up area.
- C. Engine Starting System:
 1. System Type: Electric, with DC solenoid-activated starting motor(s).
 2. Battery(s):
 - a. Battery Type: Lead-acid.
 - b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.
 - c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.
 3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.
 4. Battery Charger:
 - a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.
 - b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.
 - c. Recognized as complying with UL 1236.
 - d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.
 - e. Provide integral DC output ammeter and voltmeter with five percent accuracy.
 - f. Provide alarm output contacts as necessary for alarm indications.

5. Battery Heater: Provide thermostatically controlled battery heater to improve starting under cold ambient conditions.
- D. Engine Speed Control System (Governor):
 1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.
 2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.
- E. Engine Lubrication System:
 1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.
- F. Engine Cooling System:
 1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.
 2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.
 3. Coolant Heater: Provide thermostatically controlled coolant heater to improve starting under cold ambient conditions; size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature.
- G. Engine Air Intake and Exhaust System:
 1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.
 2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.
 3. Exhaust Silencer: Provide residential grade or better exhaust silencer with sound attenuation not less than basis of design; select according to manufacturer's recommendations to meet sound performance requirements, where specified.

2.04 ALTERNATOR (GENERATOR)

- A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 00001; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.
- B. Exciter:
 1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.
 2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.
 3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.
- C. Temperature Rise: Comply with UL 2200.
- D. Insulation System: NEMA MG 00001, Class H; suitable for alternator temperature rise.
- E. Enclosure: NEMA MG 00001, drip-proof.
- F. Total Harmonic Distortion: Not greater than five percent.
- G. Alternator Heater: Provide strip heater to prevent moisture condensation on alternator windings.

2.05 GENERATOR SET CONTROL SYSTEM

- A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.
- B. Control Panel:

1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.
2. Generator Set Control Functions:
 - a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).
 - b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.
 - c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.
 - d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.
 - e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.
 - f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).
 - g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.
3. Generator Set Status Indications:
 - a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
 - b. Current (Amps): For each phase.
 - c. Frequency (Hz).
 - d. Real power (W/kW).
 - e. Reactive power (VAR/kVAR).
 - f. Apparent power (VA/kVA).
 - g. Power factor.
 - h. Duty Level: Actual load as percentage of rated power.
 - i. Engine speed (RPM).
 - j. Battery voltage (Volts DC).
 - k. Engine oil pressure.
 - l. Engine coolant temperature.
 - m. Engine run time.
 - n. Generator powering load (position signal from transfer switch).
4. Generator Set Protection and Warning/Shutdown Indications:
 - a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:
 - 1) Overcrank (shutdown).
 - 2) Low coolant temperature (warning).
 - 3) High coolant temperature (warning).
 - 4) High coolant temperature (shutdown).
 - 5) Low oil pressure (shutdown).
 - 6) Overspeed (shutdown).
 - 7) Low fuel level (warning).
 - 8) Low coolant level (warning/shutdown).
 - 9) Generator control not in automatic mode (warning).
 - 10) High battery voltage (warning).
 - 11) Low cranking voltage (warning).
 - 12) Low battery voltage (warning).
 - 13) Battery charger failure (warning).
 - b. In addition to NFPA 110 requirements, provide the following protections/indications:
 - 1) High AC voltage (shutdown).
 - 2) Low AC voltage (shutdown).
 - 3) High frequency (shutdown).
 - 4) Low frequency (shutdown).
 - 5) Overcurrent (shutdown).
 - c. Provide contacts for local and remote common alarm.
 - d. Provide lamp test function that illuminates all indicator lamps.
5. Other Control Panel Features:
 - a. Event log.

- C. Remote Annunciator:
 - 1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.
 - 2. Generator Set Status Indications:
 - a. Generator powering load (via position signal from transfer switch).
 - b. Communication functional.
 - 3. Generator Set Warning/Shutdown Indications:
 - a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following indications:
 - 1) Overcrank (shutdown).
 - 2) Low coolant temperature (warning).
 - 3) High coolant temperature (warning).
 - 4) High coolant temperature (shutdown).
 - 5) Low oil pressure (shutdown).
 - 6) Overspeed (shutdown).
 - 7) Low fuel level (warning).
 - 8) Low coolant level (warning/shutdown).
 - 9) Generator control not in automatic mode (warning).
 - 10) High battery voltage (warning).
 - 11) Low cranking voltage (warning).
 - 12) Low battery voltage (warning).
 - 13) Battery charger failure (warning).
 - b. Provide audible alarm with silence function.
 - c. Provide lamp test function that illuminates all indicator lamps.
- D. Remote Emergency Stop: Provide approved red, mushroom style remote emergency stop button where indicated or required by authorities having jurisdiction.

2.06 GENERATOR SET ENCLOSURE

- A. Enclosure Type: Sound attenuating, weather protective.
- B. Enclosure Material: Steel or aluminum.
- C. Hardware Material: Stainless steel.
- D. Color: Manufacturer's standard.
- E. Access Doors: Lockable, with all locks keyed alike.
- F. Openings: Designed to prevent bird/rodent entry.
- G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.
- H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating material.
- I. Exhaust Silencers: Where exhaust silencers are mounted within enclosure in main engine compartment, insulate silencer to minimize heat dissipation as necessary for operation at rated load under worst case ambient temperature.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.
- C. Verify that rough-ins for field connections are in the proper locations.
- D. Verify that mounting surfaces are ready to receive equipment.

- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.
- D. Arrange equipment to provide minimum clearances and required maintenance access.
- E. Provide required support and attachment in accordance with Section 260529.
- F. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.
- G. Provide diesel fuel piping and venting where not factory installed.
- H. Provide engine exhaust piping in accordance with Section 235100, where not factory installed.
 - 1. Include piping expansion joints, piping insulation, thimble, condensation trap/drain, rain cap, hangers/supports, etc. as indicated or as required.
 - 2. Do not exceed manufacturer's maximum back pressure requirements.
- I. Install exhaust silencer where not factory installed.
- J. Provide grounding and bonding in accordance with Section 260526.
- K. Identify system wiring and components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

- A. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.
- D. Preliminary inspection and testing to include, at a minimum:
 - 1. Inspect each system component for damage and defects.
 - 2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
 - 3. Check for proper oil and coolant levels.
- E. Prepare and start system in accordance with manufacturer's instructions.
- F. Provide field emissions testing where necessary for certification.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.
- B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of four hours of training.
 - 3. Instructor: Manufacturer's authorized representative.
 - 4. Location: At project site.

- C. After successful acceptance test and just prior to Substantial Completion, replace air, oil, and fuel filters and fill fuel storage tank.

3.06 PROTECTION

- A. Protect installed engine generator system from subsequent construction operations.

3.07 MAINTENANCE

- A. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of engine generator system for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.
- B. Provide trouble call-back service upon notification by Owner:
 - 1. Provide on-site response within 4 hours of notification.
 - 2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
 - 3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

END OF SECTION

**SECTION 263600
TRANSFER SWITCHES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:
 - 1. Automatic transfer switches.
 - 2. Includes service entrance rated transfer switches.
 - 3. Includes bypass/isolation transfer switches.
 - 4. Remote annunciators.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 263213 - Engine Generators: For interface with transfer switches.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- C. NEMA IA 10042-1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment; 2025.
- D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.
 - a. Engine Generators: See Section 263213.
 - 2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
 - 3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 4. Coordinate the work with placement of supports, anchors, etc. required for mounting.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.

- C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.
 - 1. Clearly indicate whether proposed short circuit current ratings are based on testing with specific overcurrent protective devices or time durations; indicate short-time ratings where applicable.
 - 2. Identify mounting conditions required for equipment seismic qualification.
- D. Manufacturer's equipment seismic qualification certification.
- E. Evidence of qualifications for installer.
- F. Evidence of qualifications for maintenance contractor (if different entity from installer).
- G. Manufacturer's certification that products meet or exceed specified requirements.
- H. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.
- I. Maintenance contracts.

1.06 QUALITY ASSURANCE

- A. Comply with the following:
 - 1. NFPA 70 (National Electrical Code).
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with power transfer systems of similar size, type, and complexity; manufacturer's authorized installer.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store transfer switches in accordance with manufacturer's instructions.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's instructions to avoid damage to transfer switch components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. Provide minimum five year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Transfer Switches:
 - 1. ASCO Transfer Switches
 - 2. Cummings Transfer Switches
 - 3. CAT Transfer Switches

2.02 TRANSFER SWITCHES

- A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Applications:
 - 1. Utilize open transition transfer unless otherwise indicated or required.
- D. Construction Type: Either "contactor type" (open contact) or "breaker type" (enclosed contact) transfer switches complying with specified requirements are acceptable.
- E. Automatic Transfer Switch:
 - 1. Transfer Switch Type: Bypass/isolation automatic transfer switch.
 - 2. Transition Configuration: Open-transition (no neutral position).
 - 3. Voltage: As indicated on the drawings.
 - 4. Ampere Rating: As indicated on the drawings.
 - 5. Neutral Configuration: Solid neutral (unswitched), except as indicated.
 - 6. Load Served: As indicated on the drawings.
- F. Comply with NEMA IA 10042-1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).
- G. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.
- H. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.
- I. Switching Methods:
 - 1. Open Transition:
 - a. Provide break-before-make transfer without a neutral position that is not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.
 - 2. Obtain control power for transfer operation from line side of source to which the load is to be transferred.
- J. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.
- K. Enclosures:
 - 1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1 or Type 12.
 - b. Outdoor Locations: Type 3R or Type 4.
 - 2. Provide lockable door(s) for outdoor locations.
 - 3. Finish: Manufacturer's standard unless otherwise indicated.
- L. Short Circuit Current Rating:
 - 1. Withstand and Closing Rating: Provide transfer switches, when protected by the supply side overcurrent protective devices to be installed, with listed withstand and closing rating not less than the available fault current at the installed location as indicated on the drawings.
- M. Automatic Transfer Switches:
 - 1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.
 - 2. Control Functions:
 - a. Automatic mode.
 - b. Test Mode: Simulates failure of primary/normal source.

- c. Voltage and Frequency Sensing:
 - 1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.
 - 2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.
 - 3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.
- d. Outputs:
 - 1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).
 - 2) Auxiliary contacts; one set(s) for each switch position.
- e. Adjustable Time Delays:
 - 1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.
 - 2) Transfer to alternate/emergency source time delay.
 - 3) Retransfer to primary/normal source time delay.
 - 4) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.
- f. In-Phase Monitor (Open Transition Transfer Switches): Monitors phase angle difference between sources for initiating in-phase transfer.
- g. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.
- 3. Status Indications:
 - a. Connected to alternate/emergency source.
 - b. Connected to primary/normal source.
 - c. Alternate/emergency source available.
- 4. Automatic Sequence of Operations:
 - a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.
 - b. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.
 - c. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.
 - d. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.
- N. Bypass/Isolation Transfer Switches:
 - 1. Description: Factory-assembled units consisting of interconnected transfer switch and bypass/isolation switch that permits manual bypass and isolation of the transfer switch with connection of the load to either source.
 - 2. Bypass/Isolation Switch Type: Provide overlapping (make-before-break) switches with no interruption of power to load. Load break (break-before-make) switches that interrupt power to load are not acceptable.
 - 3. Bypass/Isolation Operation:
 - a. Operable from exterior of enclosure.
 - b. Normal Mode: Provides for normal operation of transfer switch.
 - c. Test Mode: Provides for operational testing of bypassed transfer switch without affecting power to load.
 - d. Isolate Mode: Provides for complete isolation of transfer switch from all power sources, permitting removal from unit.

- O. Remote Annunciators:
 - 1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.
 - 2. Transfer Switch Status Indications:
 - a. Connected to alternate/emergency source.
 - b. Connected to primary/normal source.
 - c. Alternate/emergency source available.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.
- C. Verify that rough-ins for field connections are in the proper locations.
- D. Verify that mounting surfaces are ready to receive transfer switches.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Arrange equipment to provide minimum clearances and required maintenance access.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install transfer switches plumb and level.
- F. Unless otherwise indicated, mount floor-mounted transfer switches on properly sized 4 inch high concrete pad constructed in accordance with Section 033000.
- G. Provide grounding and bonding in accordance with Section 260526.
- H. Identify transfer switches and associated system wiring in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Prepare and start system in accordance with manufacturer's instructions.
- C. Automatic Transfer Switches:
 - 1. Inspect and test in accordance with NETA ATS, except Section 4.
 - 2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The insulation-resistance tests listed as optional are not required.
- D. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of transfer switches to Owner, and correct deficiencies or make adjustments as directed.
- B. Training: Train Owner's personnel on operation, adjustment, and maintenance of transfer switches.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of four hours of training.
3. Instructor: Manufacturer's authorized representative.
4. Location: At project site.

3.06 PROTECTION

- A. Protect installed transfer switches from subsequent construction operations.

3.07 MAINTENANCE

- A. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of transfer switches for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

END OF SECTION

**SECTION 26 5100
INTERIOR LIGHTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts and drivers.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 33.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).
- B. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.
- C. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- E. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.
- F. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- G. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. CFC & CBC, 2022.
- J. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- K. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- L. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
 - 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
 - 3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
 - 4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. Shop Drawings:
 - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 - 2. Provide photometric calculations where luminaires are proposed for substitution upon request.

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
 - 2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IESNA LM-63 standard format upon request.
 - 3. Ballasts: Include wiring diagrams and list of compatible lamp configurations.
 - 4. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.
- C. Samples:
 - 1. Provide one sample(s) of each luminaire proposed for substitution upon request.
- D. Certificates for Dimming Ballasts: Manufacturer's documentation of compatibility with dimming controls to be installed.
- E. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.
 - 2. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.
 - 3. Extra Ballasts: Two percent of total quantity installed for each type, but not less than one of each type.
- G. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. Provide five year manufacturer warranty for all LED luminaires, including drivers.
- B. Provide five year pro-rata warranty for batteries for emergency lighting units.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings or equal.
- B. Refer to Division 1 for substitution requests.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
 - 1. Ceiling Compatibility: Comply with NEMA LE 4.
 - 2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
- H. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 EMERGENCY LIGHTING UNITS

- A. Description: Emergency lighting units complying with 2022 CBC and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- C. Battery:
 - 1. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.04 EXIT SIGNS

- A. Description: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with 2022 CBC and all applicable state and local codes, and listed and labeled as complying with UL 924.
 - 1. Number of Faces: Single or double as indicated or as required for the installed location.
 - 2. Directional Arrows: As indicated or as required for the installed location.

2.05 BALLASTS AND DRIVERS

- A. Ballasts/Drivers - General Requirements:
 - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
 - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
- B. Dimmable LED Drivers:
 - 1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
 - 2. Control Compatibility: Fully compatible with the dimming controls to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with 2022 CEC.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install products in accordance with manufacturer's instructions.
- D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Suspended Ceiling Mounted Luminaires:
 - 1. Do not use ceiling tiles to bear weight of luminaires.
 - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
 - 3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
 - 4. Secure pendant-mounted luminaires to building structure.
 - 5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
 - 6. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
- G. Recessed Luminaires:
 - 1. Install trims tight to mounting surface with no visible light leakage.
 - 2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
 - 3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- H. Suspended Luminaires:
 - 1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
 - 2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
 - 3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet between supports.
 - 4. Install canopies tight to mounting surface.
- I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- J. Install accessories furnished with each luminaire.

- K. Bond products and metal accessories to branch circuit equipment grounding conductor.
- L. Emergency Lighting Units:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- M. Exit Signs:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- N. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

- A. Inspect each product for damage and defects.
- B. Operate each luminaire after installation and connection to verify proper operation.
- C. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.06 CLEANING

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.
- B. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 26 5100

**SECTION 26 5600
EXTERIOR LIGHTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior luminaires.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 33.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.
- B. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- G. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. Shop Drawings:
 - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 - 2. Provide photometric calculations where luminaires are proposed for substitution upon request.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
- C. Samples:
 - 1. Provide one sample(s) of each luminaire proposed for substitution upon request.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 WARRANTY

- A. Provide five year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings or equal.
- B. Refer to Division 1 for substitution requests.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install products in accordance with manufacturer's instructions.
- D. Install luminaires in accordance with NECA/IESNA 501.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

- F. Install accessories furnished with each luminaire.
- G. Bond products and metal accessories to branch circuit equipment grounding conductor.
- H. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

- A. Inspect each product for damage and defects.
- B. Operate each luminaire after installation and connection to verify proper operation.
- C. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.06 CLEANING

- A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.
- B. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 26 5600

**SECTION 21 1100
FACILITY FIRE-SUPPRESSION WATER-SERVICE PIPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water pipe.
- B. Valves.
- C. Fire department connections.
- D. Private fire hydrants.
- E. Pressure reducing valves.
- F. Water meters.
- G. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.
- B. Section 21 1300 - Fire-Suppression Sprinkler Systems.
- C. Section 31 2316 - Excavation.
- D. Section 31 2323 - Fill and Backfill.
- E. Section 33 0561 - Concrete Manholes.
- F. Section 33 1416 - Site Water Utility Distribution Piping.
- G. EMWD – Appendix A – Approved Materials List

1.03 REFERENCE STANDARDS

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- B. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2016.
- C. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators; 2019.
- D. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2016).
- E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- F. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications; 2014.
- G. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2018.
- H. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- I. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015, with Editorial Revision (2018).
- J. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2017.
- K. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2015.
- L. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 1998 (Reapproved 2011).
- M. AWWA C203 - Coal-Tar Protective Coatings and Linings for Steel Water Pipe; 2015.
- N. AWWA C550 - Protective Interior Coatings for Valves and Hydrants; 2017.

- O. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings; 2013.
- P. AWWA C700 - Cold-Water Meters -- Displacement Type, Metal Alloy Main Case; 2015.
- Q. AWWA C703 - Cold-Water Meters -- Fire-Service Type; 2015.
- R. AWWA C800 - Underground Service Line Valves and Fittings; 2014.
- S. AWWA M11 - Steel Water Pipe - A Guide For Design and Installation; 2016.
- T. AWWA M23 - PVC Pipe - Design and Installation; 2002.
- U. FM (AG) - FM Approval Guide; current edition.
- V. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- W. UL (DIR) - Online Certifications Directory; Current Edition.
- X. EMWD Standard Drawings.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Welders Certificate: Include welders certification of compliance with ASME BPVC-IX.
- C. Product Data:
 - 1. Include data on pipe materials, pipe fittings, valves, and accessories.
 - 2. Provide manufacturer's catalog information.
 - 3. Indicate valve data and ratings.
 - 4. Show grooved joint couplings, fittings, valves, and specialties on drawings and product submittals, specifically identified with the manufacturer's style or series designation.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years documented experience.
- D. Coupling Manufacturer:
 - 1. Perform on-site training by factory-trained representative to Contractor's field personnel in the proper use of grooving tools and installation of grooved joint products.
- E. Products:
 - 1. Listed, classified, and labeled as suitable for the purpose specified and indicated.
 - 2. Refer to FM (AG) - FM Approval Guide, UL (DIR), and requirements by the City of Perris, Fire Marshall.
- F. Perform Work in accordance with local authorities having jurisdiction, municipality, and water utility requirements.

PART 2 PRODUCTS

201 WATER PIPE

- A. PVC Pipe: Listed, AWWA C900.
 - 1. Fittings: AWWA C110
 - 2. Joints: PVC pipe shall be furnished in twenty-foot nominal laying length and have bell-end push-on joints employing a single elastomeric gasket in accordance with AWWA Standard C900.
- B. Ductile Iron Pipe and Fittings: Provide ductile iron pipe and fittings for riser sections, and above

ground transitions. Comply with AWWA C151 and AWWA C110; cement-mortar lined per AWWA C104 and bituminous coated

1. Joints: Mechanical joint per AWWA C111.

202 VALVES

A. General:

1. Valves shall be in conformance with EMWD specifications, Section 15102 – Resilient-Seated Gate Valves, and Section 15103 – Butterfly Valves.
2. Valves shall be in conformance with EMWD Appendix A – Approved Materials List.
3. Valves shall comply with AWWA C-509, AWWA C-515, and AWWA C-550 as applicable.

B. Double Check Detector Assemblies

1. Double check detector assemblies size shall be per construction drawings, EMWD standard drawing B-657 and EMWD approved materials list.

203 FIRE DEPARTMENT CONNECTIONS:

- A. Fire department connection shall be comparable to Potter-Roemer Inc., No. 5705 or 5745, two-way or three-way single clapper-ductile iron body, angle threaded outlet, as called out on plans. Red enamel finish, lettered "Auto. Spkr." brass swing clapper and pin lug swivels. Size 4 inches by 2-1/2 inches by 2-1/2 inches.
- B. Plugs shall be 5940 2-1/2 inch brass pin lug plug with chain on each inlet connection.
- C. Riser to be 4 inch galvanized steel pipe threaded to fit inlet connection above. Paint red and provide 4 inch check valve underground between inlet connection and sprinkler main.

204 WATER METERS

- A. Provide water meter approved by EMWD standard drawing B-342 and Approved materials list.

205 ACCESSORIES

- A. Restraint fittings shall be per EMWD standard drawing B-663.
- B. Water Meter Boxes and Lid covers shall be

PART 3 EXECUTION

301 INSTALLATION

A. General Requirements:

1. Location of Water Lines:
 - a. Terminate the work covered by this Section at a point approximately 5 feet from the building unless indicated otherwise.
 - b. Do not install water line closer horizontally than 10 feet from any sewer line unless indicated otherwise.
 - c. Water Piping Parallel With Sewer Piping:
 - 1) Install water piping minimum 10 feet horizontally (measured edge-to-edge) from a sewer or sewer manhole where possible.
 - 2) Bottom (Invert) of Water Piping:
 - (a) Minimum 18 inches above top (crown) of sewer piping.
 - (b) Where this vertical separation of 18 inches above top (crown) of sewer piping cannot be obtained, the installation will be acceptable only when sewer piping is constructed of AWWA approved water pipe and pressure tested in place without leakage prior to backfilling.
 - d. Water Piping Crossing Sewer Piping:
 - 1) Crossing Under:
 - (a) Where water lines cross under gravity sewer lines, encase sewer line fully in concrete for a distance of at least 10 feet on each side of the crossing, unless sewer line is made of pressure pipe with rubber gasketed joints and no joint is located within 3 feet horizontally of the crossing.
 - 2) Crossing Over:

2. Sleeving:
 - a. Sleeve water piping where piping is required to be installed within 3 feet of existing structures.
 - b. Provide ductile iron or Schedule 40 steel sleeves.
 - c. Fill annular space between pipe and sleeves with mastic.
 - d. Install water pipe and sleeve without damaging structures or causing settlement or movement of foundations or footings.
 3. Pipe Laying and Jointing:
 - a. Remove fins and burrs from pipe and fittings.
 - b. Prior to placing in position, clean pipe, fittings, valves, and accessories, and maintain in clean condition.
 - c. Provide proper facilities for lowering pipe sections into trenches.
 - d. Dropping or dumping of piping, fittings, valves, or any other water line material into trenches is not permitted.
 - e. Cut pipe in a neat, workmanlike manner accurately to length established at the site and work into place without forcing or springing.
 - f. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material.
 - g. Wedging or blocking between bells and spigots will not be permitted.
 - h. Install bell-and-spigot pipe with the bell end pointing in the direction of laying.
 - i. Grade the pipeline in straight lines avoiding the formation of dips and low points.
 - j. Support piping at proper elevation and grade.
 - k. Secure firm, uniform support.
 - l. Wood support blocking will not be permitted.
 - m. Install pipe so that the full length of each pipe section and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings.
 - n. Provide anchors and supports where indicated and necessary for fastening work into place.
 - o. Provide proper provisions for expansion and contraction of pipelines.
 - p. Keep trenches free of water until joints have been properly made.
 - q. Close open ends of piping temporarily with wood blocks or bulkheads at the end of each workday.
 - r. Do not install pipe during unacceptable trench conditions or inclement weather.
 - s. Minimum Depth of Pipe Cover: Not less than 2-1/2 feet.
 4. Connections to Existing Water Lines:
 - a. Ensure minimal interruption of service on the existing line.
 - b. Make connections to existing lines under pressure in accordance with the recommended procedures of the manufacturer of the pipe being tapped.
- B. Valves:
1. Set valves on solid bearing.
 2. Center and plumb valve box over valve.
 3. Set box cover flush with finished grade.

3.02 SERVICE CONNECTIONS

- A. Provide fire water service per EMWD Standard Drawings and Standard Specifications Section 02718, as shown on the Construction Plans.

3.03 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
1. Provide all labor, equipment, and incidentals required for field testing.
 2. Conduct piping tests before upon completion of the laying, jointing, backfilling, and proper curing of the joints, and compaction of backfill, per EMWD specifications Section 02718 for installation of water pipeline.
 3. All pipes shall be tested under a pressure 1 1/2 times the pressure rating of the

pipe, but not less than 150 pounds per square inch. Maximum test pressure shall not exceed 225 pounds per square inch unless otherwise specified by the Engineer.

4. If the initial treatment results in an unsatisfactory bacterial test, the original chlorination procedure shall be repeated by the contractor until satisfactory results are obtained.

304 CLEANING

- A. Upon completion of the installation of water lines and appurtenances, remove and haul away all surplus material, including debris resulting from the work.

END OF SECTION

**SECTION 31 1000
SITE CLEARING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Clearing and protection of vegetation.
- B. Removal of existing debris.

1.02 RELATED REQUIREMENTS

- A. Section 01 5713 - Temporary Erosion Control.
- B. Section 31 2200 - Grading: Topsoil removal.
- C. Section 31 2323 - Fill and Backfill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.03 PROJECT CONDITIONS

- A. Conform to applicable regulations relating to environmental requirements, disposal of debris and use of herbicides.
- B. Coordinate clearing work with utility companies.
- C. Protect bench marks, survey control points, and existing structures from damage or displacement.

PART 2 PRODUCTS

2.01 -- NOT APPLICABLE --

PART 3 EXECUTION

3.01 PREPARATION

- A. Locate and identify utilities to remain.
- B. Verify existing plants designated to remain are tagged or identified.

3.02 PROTECTION

- A. Tag existing plants designated to remain.
- B. Protect utilities that remain from damage. All existing utilities to remain should be located and flagged.
- C. Protect trees, plant growth, and features designated to remain as final landscaping.
- D. Protect bench marks and lot corner monumentation from damage or displacement.

3.03 SITE CLEARING

- A. Comply with other requirements specified in Section 01 7000 - "Execution Requirements".
- B. Clear areas required for access to site and execution of work.
- C. Minimize production of dust due to clearing operations; do not use water if that will result in flooding, sedimentation of public waterways or storm sewers, or other pollution.
- D. Remove trees, shrubs and stumps indicated. All excavation should be conducted in a manner not to cause loss of bearing and/or lateral support of existing structures or utilities.
- E. Clear surface vegetation, undergrowth and deadwood without disturbing subsoil.
- F. Remove surficial soils containing roots and perishable materials.
- G. Abandoned underground utilities lines should be traced out and completely removed. Cap ends as indicated on Civil Demolition drawings.

3.04 DEBRIS

- A. Remove existing loose soil, vegetation, debris and other unsuitable materials for all building, slab and pavement areas and all other graded surfaces.

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

END OF SECTION

**SECTION 31 2200
GRADING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Removal of topsoil.
- B. Rough grading the site for site structures, building pads, and parking areas.
- C. Finish grading .

1.02 RELATED REQUIREMENTS

- A. Section 01 4500 - Temporary Erosion Control.
- B. Section 31 1000 - Site Clearing.
- C. Section 31 2316 - Excavation.
- D. Section 31 2323 - Fill and Backfill: Filling and compaction.
- E. APPENDIX "A" - Report of Geotechnical Investigation, as prepared by Inland Foundation Engineering, Inc., dated September 23, 2025.

1.03 SUBMITTALS

- A. See Section 01 3000 - Submittals for submittal procedures.
- B. Samples: Submit 10-lb sample of each type of fill to testing laboratory in air tight containers.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with the plans and these specifications.

1.05 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts and slope gradients

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil - Soil Type : Topsoil excavated on-site.
 - 1. Graded.
 - 2. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
- B. Other Fill Materials: See Section 31 2323.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.
- B. Verify site conditions.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Protect bench marks, existing structures, sidewalks, pavements and curbs from excavating equipment and vehicular traffic.
- C. Stake and flag locations of known underground, above ground and aerial utilities.
- D. Protect above and below grade utilities which are to remain.
- E. Notify utility company to remove, rebuild or relocate utilities.

3.03 ROUGH GRADING

- A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

- B. Do not remove topsoil when wet.
- C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
- D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.
- E. When excavating through roots, perform work by hand and cut roots with sharp axe.
- F. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.04 SOIL REMOVAL

- A. Stockpile excavated topsoil on site.
- B. Stockpile topsoil to be re-used on site; remove remainder from site.
- C. Remove excavated topsoil from site.
- D. Stockpile excavated subsoil on site.
- E. Stockpile subsoil to be re-used on site; remove remainder from site.
- F. Remove excavated subsoil from site.
- G. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.05 FINISH GRADING

- A. Before Finish Grading:
 - 1. Verify building and trench backfilling have been inspected.
 - 2. Verify subgrade has been contoured and compacted.
- B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.
- C. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.
- D. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

3.06 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 1/2 inch from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 1/4 inch from required elevation.

3.07 FIELD QUALITY CONTROL

- A. See Section 31 2323 for compaction density testing.

3.08 CLEANING

- A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.
- B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

**SECTION 31 2316
EXCAVATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Excavating for footings, slabs-on-grade, and site structures.
- B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

- A. Section 01 57 13 - Temporary Erosion Control.
- B. Section 01 7000 - Execution Requirements: General requirements for dewatering of excavations and water control.
- C. Section 31 22 00 - Grading: Grading.
- D. Section 31 2323 - Fill and Backfill: Fill materials, filling, and compacting.

PART 2 PRODUCTS

2.01 -- NOT APPLICABLE --

PART 3 EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 31 2200 for additional requirements.
- C. Locate, identify, and protect utilities that remain and protect from damage.

3.02 EXCAVATING

- A. Excavate to accommodate new structures and construction operations.
- B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
- C. Do not interfere with 45 degree bearing splay of foundations.
- D. Cut utility trenches wide enough to allow inspection of installed utilities.
- E. Hand trim excavations. Remove loose matter.
- F. Remove excess excavated material from site.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 45 00 - "Quality Control", for general requirements for field inspection and testing.
- B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

3.04 PROTECTION

- A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

**SECTION 31 2323
FILL AND BACKFILL**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Filling, backfilling, and compacting for site grading and footings, slabs-on-grade, and site structures.
- B. Backfilling and compacting for utilities outside the building to utility main connections.
- C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

- A. Section 01 5713 - Temporary Erosion Control.
- B. Section 32 1313 - Portland Cement Concrete Paving: Leveling bed placement under paving.
- C. Section 03 300 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; 2010.
- B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012.
- C. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
- D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.
- E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
- F. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- G. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.
- H. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

1.04 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: That portion on which pavement, concrete, surfacing, base, subbase, or a layer of other material is placed.. For structures, the soil prepared to support the structure.

1.05 SUBMITTALS

- A. See Section 01 3000 - "Submittals", for submittal procedures.
- B. Materials Sources: Submit name of imported materials source.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.
- D. Compaction Density Test Reports.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where indicated.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.

3. Protect stockpiles from erosion and deterioration of materials.
- C. Verify that survey bench marks and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. General Fill - Onsite excavated materials are generally considered acceptable.
- B. General Fill: Subsoil excavated on-site.
 1. Rocks larger than 1 inch in the largest dimension should not be placed within the upper 12 inches of fill beneath footings and slabs or the upper 18 inches under paved areas.
- C. Structural Fill: Conforming to State of California Department of Transportation standard.
- D. Structural Fill: Subsoil excavated on-site.
 1. Graded.
 2. Free of lumps larger than 3 inches, rocks larger than 1 inch, and debris.
- E. Concrete for Fill: Lean concrete, 1 or 2 sack slurry.
- F. Granular Fill: Coarse aggregate, conforming to State of California Department of Transportation standard.
- G. Sand: Conforming to State of California Department of Transportation standard.

2.02 ACCESSORIES

- A. Geotextile Fabric: Non-biodegradable, woven, Structural Geogrid BX1200; manufactured by Tensar Earth Technologies, Inc., or approved equal by Architect; submittal required.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 31 2200 for additional requirements.
- C. Final bottom surfaces of all excavations should be observed and approved by the project geotechnical engineer prior to placement of fill.

3.02 PREPARATION

- A. All structures and pavements should be uniformly supported by compacted fill.
- B. Building footprints and all other structures should over-excavated to at least 5 feet below the bottom of footings.
- C. Over-excavations should extend at least 5 feet beyond the structure footprint.
- D. Depth of over-excavation should be uniform across the entire structure.
- E. Pavement and flatwork areas should be over-excavated at least 1 foot below subgrade
- F. Over-excavation should extend at least 1 foot beyond the edge of paved areas.
- G. Scarify over-excavated bottoms to additional depth of 6 inches
- H. Moisture condition scarified surface:
 1. Coarse-grained materials: Within 3 percent of optimum moisture content.
 2. Fine-grained materials: 0 to 2 percent of optimum moisture content.
- K. Surface should be re-compacted to at least 90 percent of laboratory maximum dry density.

3.03 FILLING

- A. Fill to contours and elevations indicated.
- B. Employ a placement method that does not disturb or damage other work.
- C. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.

- E. 1. Coarse-grained materials: Within 3 percent of optimum moisture content.
- F. 2. Fine-grained materials: 0 to 2 percent of optimum moisture content.
- G. Granular Fill: Place and compact materials in equal continuous layers not exceeding 8 inches compacted depth. Compact to at least 90 percent of laboratory maximum dry density as determined by ASTM Standard D1557.
- H. Slope grade away from building minimum 0.5 feet in 10 feet on pervious surfaces and 0.2 feet in 10 on impervious surfaces, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- I. Correct areas that are over-excavated.
 - 1. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.
- J. Compaction Density Unless Otherwise Specified or Indicated:
 - 1. Under paving, slabs-on-grade, and similar construction: 95 percent of maximum dry density at 12 inches below subgrade.
- K. Reshape and re-compact fills subjected to vehicular traffic.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 45 00 - "Quality Control", for general requirements for field inspection and testing.
- B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.
- C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

3.05 CLEANING

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

**SECTION 32 1216
ASPHALTIC CONCRETE PAVING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Asphaltic concrete paving and surface sealer.
- B. Aggregate base course.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.
- B. Section 09 9000 - Paints and Coatings: Pavement markings.
- C. Section 32 1313 - Portland Cement Concrete Paving.

1.03 QUALITY ASSURANCE

- A. Perform work in accordance with Standard Specifications for Public Works Construction, latest edition, Section 203-6.
- B. Mixing Plant: Conform to Standard Specifications for Public Works Construction, latest edition, Section 203-6.
- C. Obtain materials from same source throughout.
- D. Maintain one copy of each document on site.

1.04 FIELD CONDITIONS

- A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Design paving and subbase at 60,000 lbs for medium duty commercial vehicle traffic.

2.02 MATERIALS

- A. Prime Coat: Homogeneous medium curing liquid asphalt, MC-70 per Standard Specifications for Public Works Construction, latest edition, Section 302-5.3.
- B. Tack Coat: AR-1000 per Standard Specifications for Public Works Construction, latest edition, Section 302-5.4.
- C. Asphalt Concrete: AR-4000 per Standard Specifications for Public Works Construction, latest edition, Section 203-6.
- D. Aggregates for binder mix shall conform to Standard Specifications for Public Works Construction, latest edition, Section 203-7, 3/4" maximum, medium grade.
- E. Seal Coat shall conform to Standard Specifications for Public Works Construction, latest edition, Section 203-9.
- F. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.
- G. Aggregate Base: Class II aggregate base shall conform to the provisions of Section 26 of the Standard Specifications for the State of California, Department of Transportation, Division of Highways, latest edition.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.02 PREPARATION - SUBBASE

- A. Preparation of subbase shall be in conformance with the Geotechnical Study.

3.03 PREPARATION - AGGREGATE BASE

- A. Preparation of Aggregate Base shall be in conformance with Sections 26-1.035, 26-1.04 and 26-1.05 of Standard Specifications of the State of California, Department of Transportation, Division of Highways, latest edition
- B. Verify gradients and elevations of base are correct.
- C. Verify that compacted subbase is dry and ready to support imposed loads.

3.04 BASE COURSE

- A. Place and compact base course.

3.05 PREPARATION - PRIMER

- A. Apply primer on base or subbase over subgrade surface at uniform rate of 1/2 gal/sq yd.
- B. Apply primer to contact surfaces.
- C. Use clean sand to blot excess primer.

3.06 PREPARATION - TACK COAT

- A. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 1/2 gal/sq yd.
- B. Coat surfaces of catch basin frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.07 PLACING ASPHALT PAVEMENT - SINGLE COURSE

- A. Install work in accordance with Standard Specifications for Public Works Construction, latest edition, Section 302-5.5.
- B. Place asphalt within 24 hours of applying primer or tack coat.
- C. Place to compacted thickness. Thickness identified on Drawings.
- D. Install gutter drainage grilles and frames in correct position and elevation.

3.08 SEAL COAT

- A. Apply seal coat to surface course in accordance with Standard Specifications for Public Works Construction, latest edition, Section 203-9, at a rate of 0.05 gal/sq yd, not less than 14 days after laying of asphalt concrete surfacing.

3.09 TOLERANCES

- A. Flatness: Maximum variation of 1/4-inch measured with a 10-foot straight edge.
- B. Variation from True Elevation: Within 1/2-inch.

3.10 STRIPING

- A. Thoroughly clean all areas where striping will be applied and locate all striping as shown on Drawings. Apply striping paint in strict accordance with manufacturer's instructions, using all means necessary to protect surface until dry.

3.11 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01 45 00 - "Quality Control".

3.12 PROTECTION

- A. Immediately after placement, protect pavement under provisions of Division 1.

END OF SECTION 32 12 16

**SECTION 32 1313
CONCRETE PAVING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete sidewalks, integral curbs, gutters, and parking areas.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.
- B. Section 07 9200 - Joint Sealants: Sealing joints.
- C. Section 31 2200 - Grading: Preparation of site for paving and base and preparation of subsoil at pavement perimeter for planting.

1.03 REFERENCE STANDARDS

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- B. ACI 301 - Specifications for Structural Concrete; 2016.
- C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018.
- E. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.
- F. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2018.
- G. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- H. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.
- I. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.
- J. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2018.
- K. PCA-PA124- Finishing Concrete with Color and Texture.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on joint filler and curing compound.

PART 2 PRODUCTS

2.01 PAVING ASSEMBLIES

- A. Comply with applicable requirements of ACI 301.
- B. Concrete Sidewalks and Median Barrier: 4,500 psi 28 day concrete, 4 inches thick, exposed aggregate finish.
- C. Parking Area Pavement: 4,500 psi 28 day concrete, 6 inches thick, _____ rebar reinforcement, wood float finish.

2.02 AGGREGATE BASE

- A. Aggregate Base Course: Thickness and size of aggregate as indicated on the drawings.

2.03 FORM MATERIALS

- A. Wood form material, profiled to suit conditions.

- B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).

2.04 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) yield strength; deformed billet steel bars; unfinished.

2.05 CONCRETE MATERIALS

- A. Obtain cementitious materials from same source throughout.
- B. Concrete Materials: As specified in Section 03 3000.
- C. Fiber Reinforcement: Synthetic fibers shown to have long-term resistance to deterioration when in contact with alkalis and moisture; 1/2 inch length.
- D. Admixtures: Fly ash is not allowed.

2.06 ACCESSORIES

- A. Curing Compound: ASTM C309, Type 1, Class A.
- B. Surface Retarder:
 - 1. Color: As selected by Architect from manufacturer's standard range.
 - 2. Used at colored concrete paving.
- C. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
 - 1. Material: ASTM D1751, cellulose fiber.

2.07 CONCRETE MIX DESIGN

- A. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- B. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard, or as recommended by manufacturer for specific project conditions.
- C. Concrete Properties:
 - 1. Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; 4,500 psi.
 - 2. Concrete compressive strength at Driveway Approaches, Site Paving & Apparatus: 4,500psi.

2.08 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.
- C. Verify base conditions.

3.02 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Notify Architect minimum 24 hours prior to commencement of concreting operations.

3.03 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.
- C. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- D. Place concrete to pattern indicated

3.05 JOINTS

- A. Place 3/8 inch wide expansion joints at 30 foot intervals and to separate paving from vertical surfaces and other components and in pattern indicated.
- B. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab, at 8'-0" O.C.

3.06 FINISHING

- A. Area Paving: Light broom, texture perpendicular to pavement direction.
- B. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.
- C. Curbs and Gutters: Light broom, texture parallel to pavement direction.
- D. Inclined Vehicular Ramps: Broomed perpendicular to slope.
- E. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.07 JOINT SEALING

- A. See Section 07 9200 for joint sealer requirements.
- B. Joint Sealant:
 - 1. Surface Preparation: All joints must be absolutely clean. For concrete, sandblasting is required. All curing compounds, old caulks, waterproofing compounds, etc., must be removed. Polyethylene rod or polyurethane foam is recommended as a joint-filler and backup material. Fillers treated with bituminous products, grease or oil, should not be used. Where present, they must be removed or separated by vinyl tape or polyethylene film. All surfaces must be primed with ELASTO-THANE PRIMER.
 - 2. Application: Apply by caulking gun, hand or pressure type, or pour from container. Bulk sealant can be applied by pumping equipment, trowel or putty knife. Press firmly into joint to assure good contact.

3.08 FIELD QUALITY CONTROL

- A. Field Inspection and testing will be performed under provisions of Section 01 4500 - "Quality Control".
- B. Testing firm will take cylinders and perform slump tests in accordance with ACI 301.

3.09 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

END OF SECTION

**SECTION 32 1713
WHEEL STOPS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Precast concrete parking bumpers and anchorage.

1.02 REFERENCE STANDARDS

- A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018.
- B. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
- C. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).
- D. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2017a.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Parking Bumpers: Precast concrete, complying with the following:
 - 1. Nominal Size: 5 inches high, 9 inches wide, 6 feet long.
 - 2. Cement: ASTM C150/C150M, Portland Type I - Normal; white color.
 - 3. Concrete Materials: ASTM C330/C330M aggregate, water, and sand.
 - 4. Reinforcing Steel: ASTM A615/A615M, deformed steel bars; unfinished, strength and size commensurate with precast unit design.
 - 5. Air Entrainment Admixture: ASTM C260/C260M.
 - 6. Concrete Mix: Minimum 5,000 psi compressive strength after 28 days, air entrained to 5 to 7 percent.
 - 7. Use rigid molds, constructed to maintain precast units uniform in shape, size and finish. Maintain consistent quality during manufacture.
 - 8. Embed reinforcing steel, and drill or sleeve for two dowels.
 - 9. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
 - 10. Minor patching in plant is acceptable, providing appearance of units is not impaired.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install units without damage to shape or finish. Replace or repair damaged units.
- B. Install units in alignment with adjacent work.
- C. Fasten units in place with 2 dowels per unit.

END OF SECTION

**SECTION 32 1723
PAVEMENT MARKINGS**

PART 2 PRODUCTS

END OF SECTION

**SECTION 32 1726
TACTILE WARNING SURFACING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Plastic tactile warning surfacing.

1.02 RELATED REQUIREMENTS

- A. Section 32 1623 - Sidewalks.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.
- C. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2018.
- D. ASTM C501 - Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser; 1984 (Reapproved 2015).
- E. ASTM C903 - Standard Practice for Preparing Refractory Specimens by Cold Gunning; 2015, with Editorial Revision (2016).
- F. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2010).
- G. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2014.
- H. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2015.
- I. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2016.
- J. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine; 2011.
- K. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013.
- L. ATBCB PROWAG - Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way; 2011.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's product data, standard details, details specific to this project, written installation, and maintenance instructions.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with minimum 3 years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified, with minimum 3 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver to project site in manufacturer's protective wrapping and in manufacturer's unopened packaging.
- B. Store covered and elevated above grade and in manufacturer's unopened packaging until ready for installation. Maintain at ambient temperature between 40 and 90 degrees F.

1.07 FIELD CONDITIONS

- A. Ambient Conditions: Do not install tiles when ambient air temperature is below manufacturer's recommendations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Plastic Tactile Warning Surfacing:
 - 1. Armor-Tile, a brand of Engineered Plastics, Inc: www.armortiletransit.com/#sle.
 - 2. EqualTile, a brand of Advanced Roadway Manufacturing, Inc: www.equaltile.com/#sle.
 - 3. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 MATERIALS

- A. Plastic Tactile Warning Surfacing:
 - 1. Material Properties:
 - a. Water Absorption: 0.20 percent, maximum, when tested in accordance with ASTM D570.
 - b. Slip Resistance: 0.50 minimum dry static coefficient of friction, when tested in accordance with ASTM D2047.
 - c. Compressive Strength: 25,000 pounds per square inch, minimum, when tested in accordance with ASTM D695.
 - d. Tensile Strength: 10,000 pounds per square inch, minimum, when tested in accordance with ASTM D638.
 - e. Flexural Strength: 25,000 pounds per square inch minimum, when tested in accordance with ASTM D790.
 - f. Abrasion Resistance: 300, minimum, when tested in accordance with ASTM C501.
 - g. Accelerated Weathering: Delta-E of less than 5.0 at 2,000 hours exposure, when tested in accordance with ASTM G155.
 - h. Adhesion: No delamination of tile prior to board failure in a temperature range of 20 to 180 degrees F, when tested in accordance with ASTM C903.
 - i. Salt and Spray Performance: No deterioration or other defect after 200 hours of exposure, when tested in accordance with ASTM B117.
 - 2. Pattern: In-line pattern of truncated domes complying with ADA Standards.

2.03 ACCESSORIES

- A. Fasteners: ASTM A666/A666M, Type 304 stainless steel.
 - 1. Type: Countersunk, color-matched composite sleeve anchors.
 - 2. Size: 1/4 inch diameter and 1-1/2 inches long.
- B. Sealant: Elastomeric sealant of color to match adjacent surfaces; approved by surfacing tile manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. When installation location is near site boundary or property line, verify required location using property survey.
- B. Verify that work area is ready to receive work:
 - 1. If existing conditions are not as required to properly complete the work of this section, notify Architect.
 - 2. Do not proceed with installation until deficiencies in existing conditions have been corrected.
- C. Verify that dimensions, tolerances, and attachment methods for work in this section are properly coordinated with other work on site.

3.02 PREPARATION

- A. Surface Preparation:

3.03 INSTALLATION

- A. Install in accordance with manufacturer's written instructions.
 - 1. Do not install damaged, warped, bowed, dented, abraded, or otherwise defective units.
 - 2. Do not install when ambient or substrate temperature has been below 40 degrees F during the preceding 8 daylight hours.
- B. Field Adjustment:
 - 1. Locate relative to curb line in accordance with ATBCB PROWAG, Sections 304 and 305.
 - 2. Orient so dome pattern is aligned with the direction of ramp.
- C. Install units fully seated to substrate, square to straight edges and flat to required slope.
- D. Cast in Place:
 - 1. When installing multiple adjacent units, leave 3/16-inch gap between units to allow for expansion.
 - 2. Tamp and vibrate units as recommended by manufacturer.
 - 3. Place and position weights on units while concrete cures.
 - 4. Ensure no voids or air pockets exist between top surface of concrete and underside of units.
- E. Surface Applied:
 - 1. Cure concrete surfaces for minimum of 4 days before installing units.
 - 2. Mechanically roughen surface as required to remove contaminants and prepare surface for adhesive and sealant application.
 - 3. When installing multiple adjacent units, leave 1/8-inch gap between tiles to allow for expansion.
 - 4. Drill fastener holes straight, true, and to depth recommended by manufacturer.
 - 5. Apply adhesive to back of unit as recommended by manufacturer.
 - 6. Mechanically fasten to substrate. Avoid striking or damaging unit during installation.
 - 7. Apply sealant to edges in cove profile.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Inspect for raised edges and misalignment.
- C. Nonconforming Work: Remove and replace.

3.05 CLEANING

- A. Remove protective plastic sheeting within 24 hours of installation.
- B. Remove excess sealant or adhesive from joints and edges.
- C. Clean four days prior to date of scheduled inspection.

3.06 PROTECTION

- A. Protect installed units from traffic, subsequent construction operations or other imposed loads until concrete is fully cured.
- B. Touch-up, repair or replace damaged products prior to Date of Substantial Completion.

END OF SECTION

**SECTION 32 3119
DECORATIVE METAL FENCES AND GATES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Decorative steel fences.
- B. Automatic gate operators.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.
- B. ASTM F2200 - Standard Specification for Automated Vehicular Gate Construction; 2017.
- C. ASTM F2408 - Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets; 2016.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit 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:
 - 1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
 - a. Provide engineering

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Decorative Metal Fences and Gates:
 - 1. Ameristar Perimeter Security, USA; -: www.ameristarfence.com/#sle.
 - 2. Builders Fence Co Inc. . Basis of Design.
 - a. P O Box 125, Sun Valley, CA 91353-0125. Phone: 800-767-0367.
Website www.buildersfence.com
 - 3. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.
- B. Automatic Gate Operators:
 - 1. Lift Master; www.liftmaster.com; Ph 800-528-5880.
 - 2. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 FENCES

- A. Fences: Complete factory-fabricated system of posts and panels, accessories, fittings, and fasteners; finished with electrodeposition coating, and having the following performance characteristics:
 - 1. Style BFC HEAVY GUARDIAN
- B. Finish: Galva-Guard III

1. ASTM-A 123
 2. Color: As selected by Architect from manufacturer's standard range.
- C. Steel: ASTM A653/A653M; tensile strength 45,000 psi, minimum.
1. Hot-dip galvanized; ASTM A653/A653M, G60.
 2. 62 percent recycled steel, minimum.

2.03 WELDED STEEL FENCE

- A. Provide fence meeting requirements for Industrial class as defined by ASTM F2408.
- B. Fence Panels: Fusion welded; 2 feet high by 6 feet long.
1. Panel Style: Two rail.
 2. Attach panels to posts with manufacturer's standard panel brackets.
 3. Attach panels to top of CMU wall as indicated on drawings.
- C. Posts: Steel tube.
1. Size: 2-1/2 inches square by 11 gage, .125 inch, with manufacturer's standard cap.
 2. Post Cap: Flush plate.
 - a. Unless otherwise indicated in drawings.
- D. Rails: Manufacturer's standard, double-wall steel channel 2 inch square by 14 gage, .078 inch with pre-punched picket holes.
1. Picket Retaining Rods: 0.125 inch galvanized steel.
 2. Picket-to-Rail Intersection Seals: PVC grommets.
- E. Pickets: Steel tube.
1. Spacing: 3-3/4 inch clear.
 2. Size: 3/4 inch square by 16 gage, .0625 inch.
 3. Style: Pickets with finial extend above top rail.
 4. Finial: Spear point.
 - a. Pickets curve outward to form Anti-Climb fence.
- F. Flexibility: Capable of following variable slope of up to 1:2.
- G. Expanded Metal: Where indicated, #16, 1/2" Diamonds, Flattened.
- H. Pedestrian Gate: Construct as indicated on drawings. Refer to Door Hardware Schedule for lockset.
- I. Vehicle Gate panels shall be as indicated on drawings.
1. Slide Gate- Motorized at site entry

2.04 MOTORIZED GATE OPERATORS

- A. Provide 1/2-HP gate operators with mouse-proof enclosures, with adjustable automatic timed gate closing device, .
1. Basis of Design; SL3000, LIFTMASTER, Inc., Oakbrook, IL. (Or approved equal) www.liftmaster.com
 2. Provide vehicle safety loop detector system to include one (1) pair reversing loops, one (1) "shadow" vehicle reversing loop, and one (1) free egress loop. Set in concrete, do not saw-cut concrete.
 3. Provide one (1) International Electronics 232FX Harsh Environment keypad on outside of wall/fence in vandal-resistant metal box with time zone for code control, hood and light with Knox lock on face plate.
 - a. Provide Gooseneck (double) Pedestal: Door King, Dual Mount model 1200-049.
 - b. Provide Keycard type gate control.
 4. Provide six (6) remote control radio entry transmitters and Multi-code 1099-50 receiver with coaxial antenna.
 - a. Remotes are to also Open/Close Overhead Coiling doors.

5. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
 - a. Primary Device: Provide NEMA 1 photo eye sensors as required with momentary-contact control device.
 - b. Secondary Device: Provide electric sensing edge with wireless edge kit as an option along with continuous-constant control device.

2.05 ACCESSORIES

- A. Hardware for Single (personnel) Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates.
 1. Lockset: Refer to Section 08 7100 - "Door Hardware".
 2. Gates shall automatically close with no more than 5 lbs force per ADA requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Set fence posts in accordance with the manufacturer recommended spacing.
- C. When cutting rails immediately seal the exposed surfaces by:
 1. Removing metal shavings from cut area.
 2. Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; allow to dry.
 3. Apply two coats of custom finish spray paint matching fence color.
 4. Failure to seal exposed surfaces in accordance with manufacturer's instructions will negate manufacturer's warranty.
- D. Space gate posts according to the manufacturers' drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.
 1. Base type and quantity of gate hinges on the application, weight, height, and number of gate cycles.
- E. Install operator in accordance with manufacturer's instructions and in accordance with NFPA 70.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Gates: Inspect for level, plumb, and alignment.

3.05 CLEANING

- A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.
- B. Clean fence with mild household detergent and clean water rinse well.

END OF SECTION

**SECTION 32 3313
SITE BICYCLE RACKS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior bicycle racks.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Mounting surface for bicycle racks.

1.03 REFERENCE STANDARDS

- A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Exterior Bicycle Racks:
 - 1. American Bicycle Security Company: www.ameribike.com/#sle.
 - 2. Highland Products Group, LLC: www.indoorbikeracks.net/#sle.
 - 3. Neenah Foundry, a division of Neenah Enterprises, Inc: www.nfco.com/#sle.
 - 4. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS.

2.02 BICYCLE RACKS

- A. Exterior Bicycle Racks: Device allows user-provided lock to simultaneously secure one wheel and part of the frame on each bicycle parked or racked.
 - 1. Style: Serpentine rack formed from a continuous round pipe.
 - 2. Capacity: Three bicycles.
 - 3. Mounting, Ground: In-ground anchor.
 - 4. Finish: Powder coat, maintenance-free and weather-resistant.
 - 5. Color: As selected by Architect from manufacturer's standard range.
 - 6. Accessories: In-ground grout cover.
- B. Materials:
 - 1. Pipe: Carbon steel, ASTM A53/A53M, Schedule 40.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine surfaces to receive bicycle racks.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.
- C. Do not begin installation until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install level, plumb, square, and correctly located as indicated on drawings.
- C. In-Ground Anchor Installation:
 - 1. Prepare holes in size according to manufacturer's instructions.
 - 2. Place anchoring bolts through the holes in pipe.

3. Lower rack into holes, ensuring the bottom of lower bends are at least 1-1/2 inch from the ground.
4. Place concrete.
5. Level rack before concrete sets.
6. Support until dry.

3.03 CLEANING

- A. Clean installed work to like-new condition. Do not use cleaning materials or methods that could damage finish.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

**SECTION 32 8400
LANDSCAPE IRRIGATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Automatic sprinkler irrigation systems and controls.

1.02 RELATED REQUIREMENTS

- A. Section 32 9300 - Trees, Plants and Ground Cover.
- B. Division 22 - Plumbing: General Requirements for piping and appurtenant work.
- C. Division 26 - Electrical: General Requirements for electrical work.

1.03 REFERENCE STANDARDS

- A. ANSI B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; '95.
- B. ASTM A536 - Standard Specification for Ductile Iron Castings; '84 (2009).
- C. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2015a.
- D. ASTM B206/B206M - Standard Specification for Copper-Nickel-Zinc Alloy (Nickel Silver) Wire and Copper-Nickel Alloy Wire; '07.
- E. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds; '08.
- F. ASTM D1869 - Standard Specification for Rubber Rings for Asbestos-Cement Pipe; '95 (225)e1.
- G. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride)(PVC) Pressure-Rated Pipe (SDR Series); 2015.
- H. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe; '08.

1.04 SUBMITTALS

- A. See Section 01 3000 - "Submittals", for submittal procedures.
- B. Product Data: Provide component and control systems and wiring diagrams.
- C. Record Documents: Record actual locations of all concealed component piping system.
- D. Operation and Maintenance Data:
 - 1. Provide instructions for operation and maintenance of system and controls, seasonal activation and shutdown, and manufacturer's parts catalog.
 - 2. Provide schedule indicating length of time each valve is required to be open to provide a determined amount of water.
 - 3.

1.05 QUALITY ASSURANCE

- A. Installer's Qualifications: Regularly engaged, and specializing, for the preceding five (5) years, in the installation of equivalent irrigation systems using solvent-gasket joints.
- B. Certifications: Provide electrical wiring, controls, motors, and devices be listed and labeled by Underwriters Laboratories, Inc. (UL).

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable code for piping and component requirements.
- B. Provide certificate of compliance from authority having jurisdiction indicating approval of products in system.

1.07 PRE-INSTALLATION MEETING

- A. Convene one (1) week prior to commencing work of this section.

1.08 WARRANTY

- A. Submit warranty forms in accordance with Division 1.
- B. During the warranty period, the Owner reserves the right to make temporary repairs as necessary to maintain the irrigation system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor of his responsibilities under the terms of the warranty as herein specified.
- C. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Design is based on the use of products as indicated on the drawings.
- B. Materials shall be products of one manufacturer and shall be either the ones upon which the design is based or those accepted in advance in accordance with Section 01 60 00 - "Product Requirements".

2.02 GENERAL PIPING

- A. Pressure main line from point of connection (POC) through backflow prevention unit: Type K copper or brass.
- B. Main lines (pressurized) 1-1/2-inch and smaller downstream of backflow prevention unit: Schedule 40 solvent-weld PVC, unless otherwise noted.
- C. Main lines (pressurized) 2-inch through 3-inch downstream of backflow prevention unit: Class 315 solvent-weld PVC, unless otherwise noted.
- D. Main lines (pressurized) 3-inches and larger downstream of backflow prevention unit: Class 200 bell and gasket PVC, unless otherwise noted.
- E. Lateral lines 1-1/2-inch and smaller: Schedule 40 solvent-weld PVC, unless otherwise noted.
- F. Lateral lines 2-inches and larger: Class 315 solvent-weld PVC, unless otherwise noted.

2.03 PLASTIC PIPE FITTINGS

- A. Solvent-weld pipe extruded of an improved PVC virgin pipe compound featuring high impact strength. Conform to ASTM D1784 or D2241 to meet the requirements of cell classification 12454B for pipe. Compound shall have a 2,000 psi hydrostatic design stress rating.
- B. Rubber Gasket PVC Pipe: Conform to ASTM D1784, Type 1, Grade 1, 2,000 psi design stress. Standard dimensional ratio for pipe shall be SDR 21 (Class 200). All pipe shall conform to commercial standards CS-256-64 (pressure rated pipe), and National Sanitation Foundation (NSF) testing laboratories. Rubber gaskets shall conform to ASTM D1869.
- C. All pipe and fittings shall bear the following markings: Manufacturer's name, nominal pipe size, schedule or class, pressure rating psi, NSF, and date of extrusion.
- D. Make solvent cement joints for plastic pipe and fittings as prescribed by the manufacturer.
- E. All PVC fittings shall be Schedule 40 PVC.
- F. All Fittings: Injection molded of an approved PVC fitting compound featuring high tensile strength, high chemical resistance, and high impact strength. Fittings shall conform to ASTM D1784, and meet the requirements of cell classification 12454B. Where threads are required in plastic fittings, these shall be injection molded also. Type: Dura Plastics Products, Spears, or approved by Architect.
- G. Rubber Gasket Fittings: Fittings shall be ductile iron deep bell type. Fittings shall be constructed of grade 65-45-12 ductile iron in accordance with ASTM A536. Fitting gaskets shall be rubber in accordance with ASTM F477. All ductile iron fittings shall be manufactured with exterior lugs and be fitted with a joint restraint system. Type: Harco Ductile Iron Fittings, Leemco Joint Restraint System or as approved by Architect.
- H. All threaded nipples: Standard weight Schedule 80, with molded threads.

- I. All threaded fittings: Use 3/4-inch size teflon tape.
- J. Reclaimed Water Pipe: Pipe shall be extruded of an improved PVC virgin pipe compound featuring high impact strength. Conform to ASTM D1784 or D2241 to meet the requirements of cell classification 12454B for pipe. Compound shall have a 2,000 psi hydrostatic design stress rating. Reclaimed water pipe shall be color coded purple with the words "CAUTION - RECLAIMED WATER" printed in black letters on two sides of the pipe. Reclaimed water pipe shall use standard white Schedule 40 PVC fittings as described above. Type: Alertline, Water Warn or as approved by Architect.
- K. Ultra-Violet Resistant (UVR) Pipe: Pipe shall be Blu-lock Pipe per plans specifications.

2.04 COPPER PIPE AND FITTINGS

- A. Copper Pipe shall be Type K, hard tempered, ASTM B88M, with fittings of wrought solder joint type in accordance with ANSI B16.22. Type Fittings: Nibco or as approved by Architect.
- B. Solder joints with silver solder: 45% silver, 15% copper, 16% zinc, 24% cadmium and solidus at 1125 degrees F, and liquidus at 1145 degrees F, conforming to ASTM B206 and FS QQB-655C.

2.05 BRASS PIPE AND FITTINGS

- A. Brass pipe shall be 85% red brass, American National Standard Institute (ANSI), Schedule 40 screwed pipe.
- B. Fittings shall be medium brass, screwed, 125-pound class.

2.06 VALVES

- A. Ball Valves: 2-inches and smaller (unless otherwise noted on Drawings): 150 psi operating pressure, maximum port design, Schedule 80 construction, with "O" ring seals. Nibco, Hammond, or as approved by Architect.
- B. Butterfly Valves: 3-inches and larger - 150 psi operating pressure, maximum port design, brass construction, with threaded connections. Nibco, Hammond, or as approved by Architect.
- C. Remote Control Valves: Size and type as shown on Drawings. Same manufacturer as controller.
 - 1. Valve Type: Spring-loaded, self-cleaning, packless diaphragm activated, normally closed type with Dupont-Zytel body, equipped with manual flow control.
 - 2. Valve Solenoid: 24 volt AC, 4.5 watt maximum, 500 milliamp maximum surge, corrosion-proof, stainless steel construction, epoxy encapsulated to form a single integral unit.
 - 3. Provide manual bleeder valve to permit operation in the field without power at the controller.

2.07 HEADS

- A. Small Lawn Sprinkler Heads: In accordance with size, type and coverage noted on Drawings.
 - 1. Body: Plastic as noted on Drawings.

2.08 BACKFLOW PREVENTION UNITS

- A. Backflow Preventer: In accordance with Irrigation Legend on Drawings.

2.09 AUTOMATIC CONTROLLER

- A. Provide type and size as noted on Drawings.
 - 1. Provide UL approved on-off switch and electrical outlet for 120 volt electrical service. Locate inside building.

2.10 ELECTRICAL WIRING AND SERVICE

- A. High Voltage: Electrical service to automatic controller shall be in accordance with Division 26 Sections. Provide final hookup to equipment as a part of the work of this section.
- B. Low Voltage:

1. Connections between controller and remote control valves shall be made with direct burial AWG-UF 600 volt wire, 14 gauge or larger, insulation thickness 3/64-inch, utilizing low density, high molecular weight polyethylene insulation.
2. Splices, where permitted, shall be waterproofed using Rainbird, Snap-Tite, Scotch-Lok No. 3576 Connectors, or fusible heat shrink tubing.
3. Pilot wires shall be red or black. Minimum size shall be No. 14 gauge.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify location of existing utilities.
- B. Verify that required utilities are available, in proper location, and ready for use.
- C. Verification of Conditions: Prior to work of this section, examine previously installed work and verify that such work is complete, and as required, to the point where this installation may properly commence.

3.02 PREPARATION

- A. Protection: Protect previously installed work and materials which may be affected by work of this section.
- B. Piping layout indicated is diagrammatic only. Route piping to avoid plants, ground cover and structures.
- C. Layout and stake locations of system components.
- D. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system.

3.03 INSTALLATION

- A. Install pipe, valves, controls, and outlets in accordance with manufacturer's instructions.
- B. Plastic Pipe and Threaded Fittings: Install in accordance with manufacturer's instructions.
 1. Assemble using approved primer and solvent to all plastic-to-plastic joints.
 2. Pipe shall be snaked within the trench as much as possible to allow for expansion and contraction.
 3. Assemble plastic pipe and threaded fittings using Teflon tape, applied to threads only.
- C. Swing Joints: Provide swing joint assemblies fabricated in accordance with Drawings.
- D. Backflow Assemblies: Install in shrub areas at minimum height permitted by local code.
- E. Backflow Prevention Unit and Automatic Controllers: Verify location with Architect. Install in accordance with manufacturer's instructions.
- F. Sprinkler Heads:
 1. Heads shall be installed as noted on Drawings.
 2. Elevate full heads in lawn areas to a minimum of 3-inches above grade.
 3. Install heads along curbs, walks, and paving, level with grade in lawn areas.
 4. Lower raised heads within ten days after notification by the Owner.
 5. Set all heads perpendicular to finished grade, unless otherwise directed by the Architect.
- G. Remote Control Valves: Install where shown on Drawings. When grouped together, allow at least 12-inches between valves. Install each control valve in a separate valve box.
- H. Install drip emitters per detail on plans.

3.04 UTILITY SERVICES

- A. Connect to existing water service at locations indicated on Drawings and make minor changes in location necessary due to actual site conditions as work of this section. Adapt to existing pipe using new couplers and reducers.
- B. Connect to existing electrical service. Make minor changes in location as necessary due to actual site conditions as work of this section.

3.05 WIRING

- A. Place wiring in the same trench and along the same routing as the pressure supply lines, except as otherwise approved.
 - 1. Install wiring prior to main line whenever possible.
 - 2. When more than one wire is placed in trench, tape wires together at maximum 10-foot centers, and lay to one side of trench.
- B. Provide an 18-inch expansion loop at each connection and directional change. Provide a sufficient length at each splice to allow valve bonnet to be brought to the surface without disconnection.
- C. Use a continuous wire between controller and remote control valves.
 - 1. Except as otherwise approved, do not splice wire at any point.
 - 2. Approved splices shall be made with Rainbird ST-03UL, Snap-Tite wire connectors with PT/55 sealer. Enclose in a box.
 - 3. Run two spare No. 14 gauge wires from controller along entirety of main line to last electrical control valve on each and every leg of main line. Label spare wires at both ends.

3.06 FIELD QUALITY CONTROL

- A. Contractor's Responsibility:
 - 1. Provide seven (7) days notice for Final Review.
 - 2. Provide up-to-date Project Record Drawings at this review.
- B. Pressure Tests:
 - 1. Do not install remote control valves, or any other valve assembly until testing of pressure main lines is completed and approved.
 - 2. Provide equipment necessary to test systems, including force pump.
 - 3. Perform hydrostatic tests in presence of the Architect.
- C. System Flushing: After sprinkler pipe lines and risers are in place and connected, and prior to installation of sprinkler heads, thoroughly flush all lines with a full head of water. Install sprinkler heads after lines have been flushed to the satisfaction of the Architect.
- D. Coverage Tests:
 - 1. Perform coverage tests after sprinkler system is completed, but prior to any planting, in the presence of the Architect.
 - 2. Test system to ensure that planting areas are watered adequately and uniformly.
 - 3. Make necessary adjustments, including realignment of heads, to provide required coverage as directed by the Architect.
 - 4. If it is determined that coverage can be improved by a nozzle change, make such changes, or arrange with the manufacturer to have such changes made, as part of the work of this section. Make changes prior to any planting.

3.07 CLEANING

- A. Upon completion of the work, restore ground surfaces to required elevations and remove excess materials, debris and equipment from the site.

3.08 DEMONSTRATION

- A. Provide instruction to maintenance personnel in proper operation of equipment in accordance with Division 1.

END OF SECTION 32 84 00

**SECTION 32 9300
TREES, PLANTS AND GROUND COVER**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Soil preparation and fertilization.
- B. Planting operations.
- C. Landscape planting materials.
- D. Provide landscape planting in the areas shown on Drawings, with plants in a healthy, vigorous growing condition. Items not specifically shown on Drawings or specified, but normally required to conform with such intent, are considered part of the work.
- E. Include labor and equipment required to place, and amend the soil. Include the cost of fertilizer as specified. If the final soils analysis results in a change to the specified amendments, a Change Order will be issued.

1.02 RELATED REQUIREMENTS

- A. Section 32 8400 - Landscape Irrigation.

1.03 REFERENCE STANDARDS

- A. American Joint Committee on Horticulture Nomenclature (AJCHN):
 - 1. Standardized Plant Names, latest edition.
- B. American Association of Nurserymen, Inc. (AAN):
 - 1. American Standard for Nursery Stock, latest edition.

1.04 SUBMITTALS

- A. See Section 01 3000 - "Submittals", for submittal procedures.
- B. Product Data: Submit complete lists of materials proposed for use, giving the manufacturer's name, catalog number, and catalog cut for each item where applicable.
- C. Quality Control Submittals:
 - 1. Substitutions:
 - a. If any plant specified is not obtainable, submit a written substitution request to the Architect during the bidding period.
 - b. Substitutions of plant materials will not be permitted unless accepted in advance in accordance with Division 1 provisions.
- D. Selection, Tagging and Ordering Plant Material:
 - 1. Submit a request for inspection and documentation to the Architect, at least one month prior to start of landscape work, and confirm that plant material has been ordered.
 - 2. Plants shall be subject to an examination and acceptance-review by the Architect after delivery for conformity to this Specification.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with applicable laws, codes and regulations required by authorities in furnishing, transporting and installing materials.
- B. Certificates: Submit certificates for the following items upon delivery to the job site:
 - 1. Quantity of fertilizer and minerals.
 - 2. Quantity of soil amendments.
 - 3. Quantity of other soil additives per agronomic soils test report.
- C. Pre-Installation Conference: Provide written projected planting schedule noting the estimated completion date, number of working days required, and special coordination requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handle plants in a manner to avoid any damage to the plant. Protect plants from sun or drying winds. Protect and maintain plants that cannot be planted immediately upon delivery.

1.07 WARRANTY

- A. Plant Material:
 - 1. Plant materials furnished under this section shall be warranted in writing, for a period of six (6) months for all trees, six (6) months for all other material, from the date of Notice of Completion for all material, against improper installation, and against defective, unsound or diseased conditions that may appear.
 - 2. Upon receipt of written notice from the Owner of the death of any warranted plant materials during the warranty period, the subject plant materials shall be promptly replaced with the same species originally planted, and of a size closely approximating the size of the plant if normal growth had occurred since the original planting. Replacements shall be subject to the requirements of this Specification.
 - 3. When plants are replaced, advise the Owner in writing, of the necessary establishment maintenance which must be performed.
 - 4. Contractor shall not be held liable for loss of plant materials that have not been maintained properly by the Owner.
 - 5.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Materials shall be the products of one manufacturer and shall be the products of manufacturer accepted in advance in accordance with Division 1.

2.02 MATERIALS

- A. Fertilizer/Soil Conditioner:
 - 1. Provide commercial fertilizer, uniform in composition, free-flowing, suitable for application with approved equipment, and delivered to site in unopened containers, each fully labeled according to applicable fertilizer laws, and bearing the name or mark of the manufacturer. Best, or equal.
 - 2. Provide 16-6-8; 12-12-12; 12-8-8 and 17-13-5, as indicated on Drawings.
- B. Accessory Materials:
 - 1. Ferrous Iron Sulfate: First quality commercial grade.
 - 2. Agricultural Gypsum: First quality commercial grade.
 - 3. Calcium Carbonate Lime: First quality commercial grade.
- C. Other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and subject to review and acceptance by the Architect.

2.03 PLANT MATERIALS

- A. Identification: Plant material shall be true to type and nomenclature in accordance with AJCHN Standardized Plant Names, and each bundle or plant shall be properly identified with durable, legible labels.
- B. Quality and Size of Plants: In accordance with rules and grading of AAN American Standard for Nursery Stock, and as shown on the Drawings.
 - 1. Trees, shrubs, vines and ground cover shall have a normal habit of growth and shall be sound, healthy, vigorous and free from insect infestations.
 - 2. Plants that meet the measurements specified, but do not possess a normal configuration or balance of height and spread, will be rejected.
 - 3. Trees and shrubs shall have grown in containers of the size stated on Drawings and shall have sufficient roots to hold the root ball together after removal from containers without being root bound.

4. Trees will be straight and of uniform shape without damaged, crooked or multiple leaders. Trees with abrasions of the bark, sun scalds, disfiguring knots, or fresh cuts of limbs over 1/2-inch that have not been pruned and painted or completely callused, will be rejected.

2.04 SOURCE QUALITY CONTROL

- A. Testing Laboratory shall be an approved Soil and Plant Laboratory. Tests shall be paid for by the Contractor.
- B. Furnish a soils analysis of existing soil. Submit one (1) quart of soil per location. (Three locations minimum).
 1. Submit soil testing laboratory's findings to Architect within five (5) days prior to backfilling.
- C. Soil testing shall be conducted for organic suitability after completion of planting in the soil preparation and backfill mix areas. Submit to the Testing Laboratory the original Amendment Specification with previously issued bulletins for soil amendments and installation procedures. Provide three (3) random samples of planting soil for analysis. Fertility analysis, recommendations, and interpretations shall be furnished by the Testing Laboratory to ensure all specified amendments made have been provided.
- D. Samples of materials, including fertilizers, soil conditioners, plants and other specified materials, shall be submitted for inspection. Delivery may begin upon approval of samples.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Inspect and accept the condition of the site relative to this section before commencing work. If not acceptable, notify the Architect in writing. By proceeding with the work of this section, the Contractor indicates his acceptance of previous related work.
 1. Landscape work shall not begin until construction activities and irrigation systems have been accepted by the Architect.

3.02 PREPARATION

- A. Soil amendments shall be rototilled into the top 12" for lawn areas and installed in all plant pits per the planting details show on plans.
- B. Protection of In-Place Conditions:
 1. Provide safeguards and exercise caution against injury or defacement of existing site improvements
 2. Be responsible for any damage resulting from landscape planting operations. Repair damage and return the area to the previous conditions at no additional cost to the Owner.

3.03 FERTILIZING AFTER PLANTING

- A. Planting areas shall receive an application of 16-6-8 commercial fertilizer at the rate of 7-1/2 pounds per 1,000 square feet, 30 days after planting.
- B. Apply all fertilizer with injector per plans.
- C. Fertilizer application shall be repeated at 30-day intervals until the end of the maintenance period.

3.04 FIELD QUALITY CONTROL

- A. General: Notify Architect at least 24 hours in advance when requesting on-site reviews.
- B. Pre-Maintenance Review:
 1. At the completion of landscape planting operations and prior to the beginning of the formal maintenance period, the Pre-Maintenance Review shall be held.
 2. Request on-site review by the Architect, five (5) working days prior to the completion of work, in order that a mutually agreeable time for review may be arranged.
 3. If, after the Pre-Maintenance Review the Architect is of the opinion that the work has been performed in accordance with the Drawings and Specifications, written notice of

preliminary acceptance will be given. This report will note any items which must be corrected, and state the date of commencement and completion of the formal maintenance period.

3.05 CLEANING

- A. Keep all areas of the work clean, neat and orderly at all times during the period of Contract. Clean construction areas at the end of each day.

END OF SECTION 32 93 00

**SECTION 33 0110.58
DISINFECTION OF WATER UTILITY PIPING SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Disinfection of site domestic water lines and site fire water lines specified in Section 33 1416.

1.02 RELATED REQUIREMENTS

- A. Section 33 1416 - Site Water Utility Distribution Piping.

1.03 REFERENCE STANDARDS

- A. AWWA B300 - Hypochlorites; 2010, Addendum 2011.
- B. AWWA B301 - Liquid Chlorine; 2010.
- C. AWWA B302 - Ammonium Sulfate; 2016.
- D. AWWA B303 - Sodium Chlorite; 2010.
- E. AWWA C651 - Disinfecting Water Mains; 2014.

1.04 QUALITY ASSURANCE

- A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three years documented experience.
- B. Testing Firm: Company specializing in testing potable water systems, certified by governing authorities of the State in which the Project is located.

PART 2 PRODUCTS

2.01 DISINFECTION CHEMICALS

- A. Chemicals: AWWA B300 Hypochlorite, AWWA B301 Liquid Chlorine, AWWA B302 Ammonium Sulfate, and AWWA B303 Sodium Chlorite.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping system and water well has been cleaned, inspected , and pressure tested.
- B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.02 DISINFECTION

- A. Use method prescribed by the SBMWD Standard Specifications and Drawings for Construction of Domestic Water Systems, or in the absence of any of these follow AWWA C651.
- B. Provide and attach equipment required to perform the work.
- C. Inject treatment disinfectant into piping system.
- D. Maintain disinfectant in system for 24 hours.
- E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.
- F. Replace permanent system devices removed for disinfection.

END OF SECTION

**SECTION 33 1416
SITE WATER UTILITY DISTRIBUTION PIPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water pipe for site conveyance lines.
- B. Pipe valves.
- C. Fire hydrants.
- D. Backflow preventers - reduced pressure principle assemblies.
- E. Backflow preventers - double check-valve assemblies.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete for thrust restraints.
- B. Section 09 9113 - Exterior Painting.
- C. Section 21 1100 - Facility Fire-Suppression Water-Service Piping.
- D. Section 33 0110.58 - Disinfection of Water Utility Piping Systems: Disinfection of site service utility water piping.

1.03 REFERENCE STANDARDS

- A. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies; 2021.
- B. ASSE 1015 - Performance Requirements for Double Check Backflow Prevention Assemblies; 2021.
- C. ASSE 1047 - Performance Requirements for Reduced Pressure Detector Backflow Prevention Assemblies; 2021.
- D. ASSE 1048 - Performance Requirements for Double Check Detector Backflow Prevention Assemblies; 2021e.
- E. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric); 2021a.
- F. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015, with Editorial Revision (2018).
- G. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2024.
- H. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020 (Reapproved 2024).
- I. NSF 61 - Drinking Water System Components - Health Effects; 2017.
- J. UL 246 - Hydrants for Fire-Protection Service; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Certify products meet or exceed specified requirements and EMWD standards and specifications.
- C. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with EMWD requirements.

PART 2 PRODUCTS

2.01 WATER PIPE

- A. PVC Pipe: ASTM D1785 Schedule 40.
 - 1. Fittings: ASTM D2466, PVC.
 - 2. Joints: ASTM D2855, solvent weld.
- B. Copper tubing: This specification shall cover the requirements for 1-inch thru 2-inch seamless, annealed, Type "K", copper water tube. Copper tubing shall meet the requirements of ASTM B-88, "Specifications for Seamless Copper Water Tube". The 1½-inch and 2-inch copper water tube shall be of the rigid type.

2.02 RESILIENT SEATED GATE VALVES

- A. Valves shall comply with AWWA C-509, AWWA C-515, and AWWA C-550 as applicable, and EMWD Standard Specification Section 15102.
- B. Resilient Seated Gate Valves shall include the following materials:
 - 1. Non-Rising Stems. Clockwise to close, counterclockwise to open. Valve stems shall be of bronze, having a minimum tensile strength of 55,000 psi and a yield point of not less than 40,000 psi, with an elongation of not less than 10% in 2". Heat treatment will be permitted to develop these requirements. All bronze shall contain not more than 7% zinc nor more than 2% aluminum.
 - 2. 2" Square Nut with arrow cast in metal to indicate opening direction, except where specified otherwise.
 - 3. Resilient Seats may be bonded or mechanically attached to either the gate or valve body
- C. Valves: Manufacturer's name and pressure rating marked on valve body.

2.03 FIRE HYDRANTS

- A. Fire Hydrants: shall be per EMWD standard drawing B-517, in compliance with the construction plans and the EMWD approved materials list.
 - 1. Approved materials:
 - a. AVK – Model 90 (24-90) series 24
 - b. CLOW – Model 2060 Bronze or Model 860
 - c. Jones – Model J-3765 Bronze
- B. Finish: Primer and two coats of enamel in color required by EMWD.

2.04 BACKFLOW PREVENTERS - REDUCED PRESSURE PRINCIPLE ASSEMBLIES

- A. Reduced Pressure Backflow Detector Assembly: shall be per EMWD standard drawing B-597a, in compliance with the construction plans and the EMWD approved materials list.

2.05 BACKFLOW PREVENTERS - DOUBLE CHECK-VALVE ASSEMBLIES

- A. Double Check-Detector Assemblies: shall be per EMWD standard drawing B-657, in compliance with the construction plans and the EMWD approved materials list.

2.06 ACCESSORIES

- A. Concrete for Thrust Restraints: Concrete type specified in EMWD standard drawing B-407.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

3.02 SERVICE CONNECTIONS

- A. Service connections shall be installed by the contractor of the size and at the locations shown on the standard drawings, and as indicated on the construction plans in conformance with EMWD standard specifications section 02718.

3.03 PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare pipe connections to equipment with flanges or unions.

3.04 TRENCHING

- A. Trenching backfilling and compaction shall be in accordance with the EMWD standard specifications section 02221 and standard drawing B-286b.

3.05 INSTALLATION - PVC PIPE

- A. Installation of the proposed waterline pipes shall be in accordance with EMWD standard specifications section 02718.
- B. Installation of the Polyvinyl Chloride (PVC) shall be in accordance with AWWA C605 and manufacturer's recommendations.
- C. Make and assemble rubber-gasketed, bell-and-spigot joints in accordance with manufacturer's recommendations.

3.06 INSTALLATION - VALVES, HYDRANTS, BACKFLOW PREVENTERS

- A. Installation of valves, hydrants and backflow preventers shall be in accordance with the EMWD specifications, standard drawings and the construction plans.

END OF SECTION

**SECTION 33 3113
SITE SANITARY SEWERAGE GRAVITY PIPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sanitary sewerage drainage piping, fittings, and accessories.
- B. Connection of building sanitary drainage system to municipal sewers.

1.02 RELATED REQUIREMENTS

- A. SBMWD Standard Specifications and Drawings for Construction of Domestic Water Systems
- B. Section 31 2316 - Excavation: Excavating of trenches.
- C. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.
- D. Section 31 2323 - Fill and Backfill: Bedding and backfilling.

1.03 DEFINITIONS

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.04 REFERENCE STANDARDS

- A. ASTM D3034 - Standard Specification for PVC non-pressure Sewer Pipe; latest edition.
- B. ASTM D3212 - Standard Specification for PVC non-pressure Sewer Pipe; latest edition.

1.05 SUBMITTALS

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

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

- A. PVC Pipe ASTM D3034 SDR 35.
- B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.02 CLEANOUTS

- A. Cleanouts shall be in conformance with the EMWD standard drawing SB-52 and the construction plans.

PART 3 EXECUTION

3.01 TRENCHING

- A. Trenching backfilling and compaction shall be in accordance with the EMWD standard specifications section 02221 and standard drawing SB-158.

3.02 INSTALLATION - PIPE

- A. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- B. Connect to building sanitary sewer outlet and municipal sewer system, through installed sleeves.

3.03 INSTALLATION – CLEANOUTS

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 - 1. Locate at each change in direction of piping greater than 45 degrees.
 - 2. Locate at minimum intervals of 50 feet.
 - 3. Locate at base of each vertical soil and waste stack.

3.04 PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.
- B. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- C. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

**SECTION 33 4211
STORMWATER GRAVITY PIPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Stormwater drainage piping.
- B. Stormwater pipe accessories.

1.02 RELATED REQUIREMENTS

- A. Section 31 2316 - Excavation: Excavating of trenches.
- B. Section 31 2323 - Fill and Backfill: Bedding and backfilling.
- C. Section 33 4230 - Stormwater Drains.

1.03 REFERENCE STANDARDS

- A. AASHTO M 252 - Standard Specification for Corrugated Polyethylene Drainage Pipe; latest edition.
- B. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Material; 2014.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 STORMWATER PIPE MATERIALS

- A. Provide products that comply with applicable code(s).

2.02 PIPE ACCESSORIES

- A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

PART 3 EXECUTION

3.01 TRENCHING

- A. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION

- A. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- B. Connect storm drainage system as shown on plans.

3.03 PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 4230 STORMWATER DRAINS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Precast concrete catch basins.
- B. Frames and grates.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.
- B. Section 31 2316 - Excavation.
- C. Section 31 2323 - Fill and Backfill.
- D. Section 33 4211 - Stormwater Gravity Piping.

1.03 REFERENCE STANDARDS

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.
- C. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- D. ACI PRC-305 - Guide to Hot Weather Concreting; 2020.
- E. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- F. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2018.
- G. ASTM C478/C478M - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections; 2020.
- H. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants; 2009 (Reapproved 2014).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Installation of stormwater drains with piping and other structures.
 - 1. See Section 33 4211 for stormwater gravity piping.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Weight rating for catch basins, drop inlets, trench drains, and frame and grates.
- C. Manufacturer's qualification statement.
- D. Installer's qualification statement.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.
- B. Installer Qualifications: Company specializing in installing work of the type specified in this section, and with at least three years of documented experience and approved by manufacturer.
- C. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.
- D. Follow recommendations of ACI PRC-305 when concreting during hot weather.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Drop Inlets:
 - 1. Pre-cast concrete Drop Inlet Catch Basins, sizes as shown on the construction plans. Products must be approved equal and meet or exceed H-20 load rating, ASTM C478/C478M compliance, wall and base thickness, and joint sealant requirements (ASTM C990).
 - 2. Substitutions: See Section 01 6000 - PRODUCT REQUIREMENTS. Products must be approved equal and meet or exceed the performance, material, load, and dimensional requirements indicated on the drawings and in these specifications.

2.02 CATCH BASINS

- A. Weight Rating: H-20 according to AASHTO HB.
- B. Precast Concrete Catch Basins: Comply with ASTM C478/C478M.
 - 1. Wall Thickness: According to manufacturer's specifications.
 - 2. Base Thickness: According to manufacturer's specifications.
 - 3. Joint Sealant: Comply with ASTM C990.
- C. Frames and Grates: Steel or cast iron grate, ADA compliant, H-20 rated.

PART 3 EXECUTION

3.01 EXCAVATION AND FILL

- A. Hand trim excavation for accurate placement to indicated elevations.
- B. Backfill with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION

- A. Establish elevations and pipe inverts for inlets and outlets as indicated in drawings.
- B. Precast Concrete Catch Basins:
 - 1. Install joint sealant uniformly around section lip.
 - 2. Install according to manufacturer's instructions and in accordance with ASTM C478/C478M and ASTM C990, ensuring plumb, alignment, and elevation per drawings.
- C. Grade Adjustments:
 - 1. Grade adjustments may use precast risers or masonry units, per manufacturer's recommendations, to achieve final elevation.
 - 2. Place adjacent materials tight and smooth following design grades.
- D. Frames and Grates:
 - 1. Place frame plumb and level.
 - 2. Mount frame on prefabricated drop inlets or trench drains according to manufacturer's instructions.
 - 3. Place grate in frame securely.

END OF SECTION

**SECTION 33 5613
ABOVE-GROUND FUEL STORAGE TANKS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pre-cast concrete vault enclosing a steel tank and a 30-mil polyethylene sealed bag.
- B. Diesel dispensing package.
- C. Log Box.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- B. Section 03 3000 - Cast-in-Place Concrete.
- C. Division 26 - Electrical:

1.03 REFERENCE STANDARDS

- A. NFPA 30- Flammable and Combustible Liquids Code; National Fire Protection Association; 2018.
- B. UL 142 - Steel Above-Ground Tanks for Flammable and Combustible Liquids; Underwriters Laboratories; '07.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 01 3000 - "Submittals", for submittal procedures.
- B. Product Data: Provide data on equipment and accessories.
- C. Shop Drawings: Indicate tank layout and configuration, equipment locations and dimensions.
- D. Manufacturer's Installation Instructions: Indicate special installation procedures.

1.06 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division 1.
- B. Include operation, maintenance and inspection data, replacement part numbers, availability and service depot location and telephone number.

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable codes and ordinances for above-ground fuel storage tanks.
- B. All proposed sites shall be reviewed and approved by the appropriate Fire Department officials.
 - 1. It shall be the Contractor's responsibility to apply for and obtain all necessary approvals and permits. This includes County and Fire Department.
- C. Above-ground tanks shall conform to UL 142.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and protect products to site under provisions of Section 01 60 00 - "Product Requirements".

1.09 WARRANTY

- A. See Section 01 7800 - Closeout Procedures, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide twenty-year warranty against manufacturing defects.

PART 2 PRODUCTS

2.01 SYSTEM

- A. The systems shall be complete and comply with requirements of governing local and state agencies. Nothing indicated on the Drawings or Specifications that is not in conformity with the above, shall be construed as deviating from the above. Specifications and Drawings are as guidelines within minimum requirements indicated.
- B. The system shall include one (1) 1,000 gallon above-ground fuel oil (diesel) tank, with appropriate appurtenant, herein specified, equipment, piping and wiring.

2.02 MANUFACTURERS

- A. Convault.
- B. Supervault.
- C. Or approved equal.
- D. Substitutions: See Section 01 6000 - Product Requirements.

2.03 MATERIALS AND COMPONENTS - ABOVE-GROUND FUEL VAULT

- A. Steel tank shall be UL listed.
- B. Steel tank shall meet requirements of NFPA 30 for above-ground tanks.
- C. Steel tank shall have 6-inch emergency vent as required by NFPA 30.
- D. Steel tank shall be rectangular
- E. Steel tank openings shall be threaded, except for detector tube.
- F. Steel tank and secondary containment shall be encased in six (6) inches of reinforced concrete.
- G. Vault shall have capability of physical monitoring between primary and secondary containment.
- H. Vault shall have exterior protective epoxy coating.
- I. Vault shall have code required warning signs.

2.04 EQUIPMENT

- A. Diesel Equipment Package - Side Mounted - Standard Flow.
 - 1. Warranty: 1 Year on Parts, 90 Days on Labor.
 - 2. Dresser Wayne S1 Reliance Dispenser & Pulsers.
 - 3. Fill Rite 713, 1/2 HP electric pump 115V.
 - 4. UL connecting hoses from pump to dispenser.
 - 5. Side Mount Bracket for above Dispenser.
 - 6. 3/4" Fuel Filter and Adapter.
 - 7. High Hose Retractor & Clamp with 3/4" x 20' Fuel Hose.
 - 8. 3/4" Breakaway & Whip Hose.
 - 9. 3/4" Swivel & Automatic Nozzle.
- B. Or approved equal.
- C. Substitutions: See Section 01 6000 - "Product Requirements".

2.05 ACCESSORIES

- A. Fuel Terminal: Install Owner Provided unit. Refer to Electrical Plans.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions are ready for vault installation.
- B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Contractor must be a certified installer approved by the manufacturer.
- B. Install operating equipment, piping and fittings in accordance with component manufacturer's instructions.
- C. Clean and flush tank. Seal until pipe connections are made.
- D. Install in accordance with manufacturer's instructions.

END OF SECTION

Appendix “A”

GEOTECHNICAL INVESTIGATION

September 23, 2025
Project No. S168-196

STK Architecture, Inc.
42095 Zeno Drive, Suite A15
Temecula, California 92590

Attention: Tony Finaldi

Subject: Geotechnical Investigation
South Perris Fire Station
East Side of Murrieta Road, North of Watson Road
Perris, California

Dear Mr. Finaldi:

This report presents the results of the geotechnical investigation for the proposed South Perris fire station. The investigation was conducted in general conformance with our proposal dated February 21, 2025.

This report includes project design and construction recommendations along with the field and laboratory data. The primary geotechnical issue is the presence of expansive soil. Non-expansive import soil is recommended to mitigate the potential for soil expansion.

We appreciate the opportunity to work with you on this project. Please call if you have any questions or need any other information.

Sincerely,
INLAND FOUNDATION ENGINEERING, INC.


Allen D. Evans, P.E., G.E.
Principal

ADE:sd

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Introduction

This report presents the results of the geotechnical investigation conducted for the proposed South Perris fire station. The proposed fire station will be located on a 3.4-acre site north of Watson Road on the east side of Murrieta Road in Perris, California. The following documents were used as references for this investigation.

- Request for Proposal, Architectural Design Services for the South Perris Fire Station Project CIP F077, prepared by the City of Perris, dated January 31, 2025
- Undated Site Plan, prepared by STK Architecture, Inc.

Scope of Service

The purpose of this geotechnical investigation was to provide geotechnical parameters for design and construction of the proposed fire station. The scope of the geotechnical services included:

- *Evaluation of existing geologic conditions at the site and review of potential geologic and seismic hazards.*
- *Evaluation of the local and regional tectonic setting and historical seismic activity, including a site-specific ground motion analysis.*
- *Reconnaissance of the site and surrounding area to ascertain the presence of unstable or adverse geologic conditions.*
- *Subsurface sampling and laboratory testing.*
- *Analysis of the data collected and the preparation of this report with geotechnical engineering conclusions and recommendations for design and construction.*

Evaluation of hazardous waste was not within the scope of services provided.

Project Description

The South Perris fire station will be a single-story wood-frame structure occupying approximately 10,900 square feet. It will be constructed in the south portion of the project site and will include three drive-through vehicle bays for storage of fire apparatus vehicles, living quarters for up to 10 personnel, locker rooms, kitchen area, a fitness room, laundry room, conference room, and offices.

An administration building will be constructed in the north portion of the site that will occupy approximately 5,200 square feet. It will also be a single-story wood-frame structure that will include offices, conference room, training room, break room and restrooms.

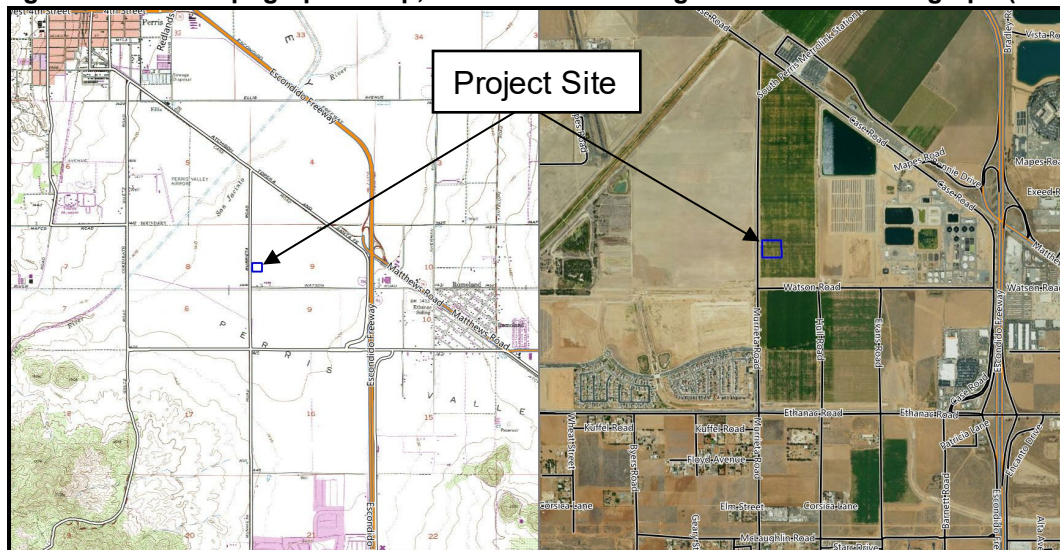
Foundations for the proposed structures are expected to consist of shallow continuous and isolated concrete spread footings with slab-on-grade floors. Site grading is expected to consist of preparation of a building pad for the proposed structures as high as four feet above existing site grades.

Two stormwater bioretention basins are planned on the west side of the site. The basin depths are expected to be no deeper than five feet below existing surface grades. Additional onsite improvements will also include driving lanes and parking areas, storage buildings, trash enclosure, transformer pad, and battery storage area. Off-site improvements to Murrieta Road will also be required.

Site Description

The subject site is located on the east side of Murrieta Road, approximately 640 feet north of Watson Road in Perris, California (33.75263°, -117.20584°), and occupies 3.4 acres. Figure 1 below shows the site location.

Figure 1: USGS Topographic Map, Perris 7.5' Quadrangle and Aerial Photograph (2022)



The site elevation is approximately 1,415 feet above mean sea level (msl). The site is relatively flat. The immediate site vicinity slopes to the west at an overall rate of less than 1 percent. Current site vegetation consists of a sparse growth of alfalfa. Figure 2 below shows the current site conditions.

Figure 2: View of Project Site Toward South



Geologic Hazards Evaluation

A geologic hazards report for this project was prepared by our subconsultant, Terra Geosciences, and is appended. The engineering geology and seismicity review was performed using the suggested “Checklist for the Review of Geologic/Seismic Reports for California Public Schools, Hospitals and Essential Services Buildings” (California Geologic Survey, Note 48, 2022).

The geologic hazards study indicates that the proposed fire station and associated structures are considered feasible from a geologic standpoint, providing that the conclusions and recommendations presented in the report are considered during planning and construction. No adverse geologic conditions were found within the proposed construction area, with the exception of the potential for strong ground shaking from nearby seismogenic fault sources.

The geologic hazards study included a site-specific ground motion analysis. The mapped spectral acceleration parameters, coefficients, and other related seismic parameters were evaluated using the OSHPD Seismic Design Maps web application (OSHPD, 2020) and the California Building Code criteria (CBC, 2022), with the site-specific ground motion analysis being performed following Section 21 of the ASCE 7-16 Standard (2017). The results of the site-specific analysis are summarized and tabulated in Table 1 below:

Table 1: Seismic Design Parameters

Factor or Coefficient	Value
S_s	1.422g
S_1	0.526g
F_a	1.2g
F_v	1.774g
S_{DS}	0.990g
S_{D1}	0.700g
S_{MS}	1.480g
S_{M1}	1.052g
T_L	8 Seconds
MCE_G PGA	0.64g
Site Class	D

Subsurface Conditions

Subsurface exploration at the site consisted of six (6) exploratory borings to depths ranging from approximately 17.0 to 51.5 feet below existing site grades. The site exploration is described in Appendix A. Boring locations are shown on Figure A-9.

The soil encountered in the borings consisted of interlayered alluvial deposits comprised of clayey sand (SC), sandy clay (CL), silty clayey sand (SC-SM), silty sand (SM), and sand with silt (SP-SM). The soil encountered was generally very loose to loose within the upper 2 feet. Below 2 feet, the coarse-grained soil encountered was generally medium dense to dense. The fine-grained soil encountered was stiff to hard. The soil was moist to very moist at the time of investigation.

Corrosion Potential: Analytical testing indicates the concentration of sulfates is 32 ppm. In accordance with ACI 318, Table 4.2.1, the soil is classified as having a negligible sulfate exposure. The chloride concentration in the tested sample was 28 ppm and indicates that the soil is generally not corrosive with respect to ferrous metal. The soil is alkaline with a pH value of 8.4. The saturated minimum resistivity value of 1,552 ohm-cm indicates the soil may be corrosive to buried ferrous metal. Alternative material such as PVC piping should be considered. Inland Foundation Engineering, Inc. does not practice corrosion engineering. A qualified corrosion engineer should be consulted for additional guidance.

Hydrocollapse Potential: Consolidation testing indicates that the soil is compressible and normally consolidated. The results show a slight potential for expansion when

saturated under anticipated foundation and soil overburden loads. Provided that the building pad area is prepared as recommended herein, and appropriate surface drainage is provided in accordance with contemporary design practice, the potential for adverse building settlement due to hydrocollapse is not significant.

Expansive Soil: Laboratory testing indicates an expansion index of 69, representing a medium expansion class. The California Building Code (CBC) requires that slabs-on-grade be designed for soil expansion if constructed on soil with an expansion index higher than 20. Conventional slabs-on-grade may be utilized but should be supported by at least 4.0 feet of imported non-expansive soil. Final recommendations to mitigate expansive soil should be made during precise grading when actual soil types are known.

Groundwater: Groundwater was encountered in borings B-02 and B-05 at depths of approximately 40.5 and 42.0 feet, respectively. Based on a review of pertinent groundwater data (referenced in appended geologic hazards report), the documented depth to groundwater in local wells is at least 49 feet. The mottled soil encountered at a depth of 35 feet in boring B-02 likely represents the historic high groundwater depth at the site.

Liquefaction and Seismically-Induced Settlement: In general, liquefaction is a phenomenon that occurs where there is a loss of strength or stiffness in the soil that can result in the settlement of buildings, ground failure, or other hazards. The main factors contributing to this phenomenon are: 1) cohesionless, granular soil with relatively low density (usually of Holocene age); 2) shallow ground water (generally less than 50 feet); and 3) moderate to high seismic ground shaking. Based on the medium dense to dense conditions encountered in the borings, the potential for soil liquefaction is not significant.

“Dry sand” settlement occurs in loose granular soil as a result of seismic ground shaking. The potential for “dry sand” settlement also is not significant, based on the medium dense to dense conditions encountered in the borings.

Infiltration Testing

Infiltration testing was conducted in general accordance with Appendix A of the Riverside County Low Impact Development BMP Design Handbook (2011). Four percolation tests were performed at the locations shown on Figure A-9. The testing procedures and the test data are described and included in Appendix C of this report.

The test results are shown in Table 2. The corresponding calculated infiltration rate (I_c) ranges from 0.3 inches per hour to 1.2 inches per hour. These values exclude a factor of safety. The appropriate factor of safety should be determined by the design engineer.

Table 2: Infiltration Rate

Percolation Test No.	Percolation Rate (min/in)	Depth Below Ground Surface (in)	Infiltration Rate (I_c) (in/hr)
I-01	4.0	60	1.2
I-02	17.1	48	0.3
I-03	17.1	60	0.3
I-04	17.1	48	0.3

Conclusions and Recommendations

The primary geotechnical issue that will require mitigation is the presence of expansive soil within the building pad area. At least 4 feet of imported non-expansive fill soil will be required below conventional slabs-on-grade to mitigate soil expansion. This and other geotechnical engineering recommendations for project design and construction are presented below.

Foundation Design: The proposed fire station and associated structures can be supported by shallow continuous and isolated spread footings designed with an allowable bearing pressure of 2,000 pounds per square foot (psf). Footings should have a minimum width of 12 inches and bottoms a minimum depth of 12 inches below the lowest adjacent grade. The allowable bearing pressure can be increased by 200 psf for each additional foot of width and by 500 psf for each additional foot of depth, to a maximum allowable bearing pressure of 3,000 psf. The allowable bearing pressure can be further increased by $\frac{1}{3}$ for short-term transient wind and seismic loads.

Static settlement of footings designed and constructed as recommended herein is expected to be less than one inch. Differential settlement between footings of similar size and load is expected to be less than one-half inch.

Lateral Resistance: Resistance to lateral loads will be provided by a combination of friction acting at the base of the slab or foundation and passive earth pressure. A coefficient of friction of 0.35 between soil and concrete may be used with dead load forces only. A passive earth pressure of 200 psf/ft may be used for the sides of footings poured against recompacted or dense native material. These values may be increased by $\frac{1}{3}$ for short-term transient wind and seismic loads. Passive earth pressure should be ignored within the upper one foot, except where confined as beneath a floor slab, for example.

Lateral Earth Pressure: Retaining walls should be designed for an active earth pressure equivalent to that exerted by a fluid weighing not less than 43 pcf. Any applicable construction or seismic surcharges should be added to this pressure. Retaining wall backfill should have an expansion index of less than 20.

Concrete Slabs-on-Grade: Potentially expansive soil is present throughout the project site. The California Building Code (CBC) requires that slab-on-grade foundations on expansive soils be designed in accordance with *WRI/CRSI Design of Slab-on-Ground Foundations (1981)* or *PTI Standard Requirements for Analysis of Shallow Concrete Foundations on Expansive Soils (2012)*. Conventional slabs-on-grade may be utilized but should be supported by at least four feet of imported non-expansive soil. Development of WRI/CRSI or PTI design parameters was beyond the scope of this investigation. This firm should be contacted if WRI/CRSI or PTI recommendations are required.

Concrete slabs-on-grade should have a minimum thickness of four inches. During final grading and prior to the placement of concrete, all surfaces to receive concrete slabs-on-grade should be compacted to maintain a minimum compacted fill thickness of 12 inches.

Load bearing slabs should be designed using a modulus of subgrade reaction (k) not exceeding 150 pounds per square inch per inch. This value is based on an applied foundation load area of 1.0 square foot. The k value should be reduced for larger foundation areas according to the following formula:

$$k_R = k * ((B+1) / 2B))^2$$

where k_R = reduced modulus of subgrade reaction
B = foundation width (feet)

Slabs should be designed and constructed in accordance with the provisions of the American Concrete Institute (ACI). Shrinkage of concrete should be anticipated and will result in cracks in all concrete slabs-on-grade. Shrinkage cracks may be directed to saw-cut "control joints" spaced on the basis of slab thickness and reinforcement. Control joint spacing in unreinforced concrete at maximum intervals equal to the slab thickness times 24 is recommended.

Slabs to receive moisture-sensitive coverings should be provided with a moisture vapor retarder/barrier designed and constructed according to the American Concrete Institute 302.1 R, Concrete Floor and Slab Construction, which addresses moisture vapor retarder/barrier construction. At a minimum, the vapor retarder/barrier should comply with ASTM E1745 and have a nominal thickness of at least 10 mils. The vapor retarder/barrier should be properly sealed, per the manufacturer's recommendations, and protected from punctures and other damage.

Portland Cement Concrete (PCC) Pavement: All surfaces that will support fire apparatus should be paved with Portland cement concrete (PCC). PCC pavement should consist of 9 inches of PCC over 12 inches of Class 2 aggregate base. The

concrete should have a minimum 28-day modulus of rupture of 600 psi. This corresponds to a compressive strength of approximately 4,500 psi.

For all other areas that will utilize PCC pavement the below table can be utilized for design sections. The following Portland cement concrete pavement sections are based on the American Concrete Institute (ACI) Guide for Design and Construction of Concrete Parking Lots and Site Paving (ACI 330-21). The concrete to be utilized for Category A and B areas as well as pedestrian areas should have a minimum 28-day modulus of rupture of 550 psi. This corresponds to a compressive strength of approximately 3,000 psi. The actual pavement subgrade soil should be evaluated during construction to verify that the recommended pavement sections are appropriate.

Table 3: Portland Cement Concrete Pavement

Service	Concrete Thickness (in.)	Aggregate Base (in.)
Car parking and access lanes (Category A)	4.25	6.0
Entrance and truck service lanes (Category B)	5.25	6.0
Pedestrian, non-vehicular hardscape	4.0	0.0

The Class 2 aggregate base should comply with current Caltrans requirements. The aggregate base should be compacted to at least 95 percent relative compaction based on ASTM D1557. The upper 12 inches of pavement subgrade soil, below the aggregate base, should also be compacted to a minimum relative compaction of 95 percent. The concrete pavement should be constructed with doweled joints and be restrained laterally by concrete curb/gutter or building foundations. The edges of the concrete should be protected from traffic loads by curbs or paved shoulders. If unrestrained pavement edges or non-doweled joints are desired, this firm should be contacted so that revised recommendations can be developed.

Construction joints should be sawcut in the pavement at a maximum spacing of 30 times the thickness of the slab, up to a maximum of 15 feet. Pavement sawcutting should be performed within 12 hours of concrete placement, preferably sooner. Sawcut depths should be equal to approximately $\frac{1}{4}$ of the slab thickness for conventional saws or one inch when early-entry saws are utilized on slabs nine inches thick or less. Construction joints should not be placed near flow lines. The use of plastic strips for formation of jointing is not recommended. The use of expansion joints is not recommended, except where the pavement will adjoin structures.

Asphalt Concrete Pavement: Recommended asphalt concrete structural pavement sections are shown below in Table 4.

Table 4: Asphalt Concrete Pavement

Service	Asphalt Concrete Thickness (ft.)	Base Course Thickness (ft.)
Light traffic (autos, parking areas, T.I. = 5.0)	0.25	0.35
Heavy traffic (trucks, driveways, T.I. = 7.0)	0.30	0.55
Murrieta Road (T.I. = 9.0)	0.70	1.00

Inland Foundation Engineering, Inc. does not practice traffic engineering. The pavement section for Murrieta Road is based on the City of Perris minimum for a traffic index (T.I.) of 9.0. The other T.I. values used to develop the recommended pavement sections are typical for projects of this type. The project civil engineer or traffic engineer should review the T.I. values used to verify that they are appropriate for this project.

General Site Grading: All grading should be performed per the applicable provisions of the 2022 California Building Code and the following recommendations.

- 1. Clearing and Grubbing:** All building and pavement areas and all surfaces to receive compacted fill should be cleared of vegetation, debris, and other unsuitable materials. All such material should be disposed of off-site.

All undocumented artificial fill and loose native soil within the grading limits should be completely removed. Such material is suitable for use as compacted fill as recommended herein.

- 2. Preparation of Surfaces to Receive Compacted Fill:** All surfaces to receive compacted fill should be reviewed by a geologist or engineer from this firm prior to processing. If roots or other deleterious materials are encountered or if the exposed excavation bottom is loose or unstable, additional over-excavation may be required until satisfactory conditions are encountered. Upon approval, surfaces to receive fill should be scarified to a minimum depth of eight inches, brought to near optimum moisture content, and compacted to a minimum of 90 percent relative compaction.
- 3. Placement of Compacted Fill:** Fill materials consisting of on-site soil or approved imported granular soil should be spread in shallow lifts and compacted at near optimum moisture content to a minimum of 90 percent relative compaction, based on ASTM D1557.
- 4. Import Soil:** All proposed import soil should be tested prior to placement on the site to verify that it is not corrosive or expansive. Recommended import soil criteria are shown in the following Table 5.

Table 5: Recommended Import Soil Criteria

Sieve Size	Recommended Criteria
Percent Passing 3-Inch Sieve	100
Percent Passing No. 4 Sieve	85 – 100
Percent Passing No. 200 Sieve	15 – 40
Plasticity Index	Less than 15
Expansion Index (ASTM D4829)	20 or less (very low)
Organic content	Less than 1 percent by weight
Sulfates	< 1,000 ppm
Min. Resistivity	> 10,000 ohm-cm

- 5. Preparation of Building Areas:** The existing ground surface in the building pad area should be over-excavated to a depth of at least 3 feet. The over-excavation area should extend at least 5 feet outside the limits of the building pad. The building pad area should be further over-excavated to the depth necessary to provide at least 2 feet of compacted fill below the deepest footing. Following excavation, the exposed soil should be evaluated by this firm to verify it is suitable to receive compacted fill. The removed soil should be placed and compacted as recommended above.
- 6. Preparation of Paving Areas:** During final grading and immediately prior to the placement of aggregate base, all surfaces to receive asphalt concrete or Portland cement concrete paving should be processed and recompact to a depth of at least 12 inches. Compaction within proposed pavement areas should be to a minimum of 95 percent relative compaction for both the subgrade and base course.
- 7. Utility Trench Backfill:** Utility trench backfill consisting of the on-site soil types should be placed by mechanical compaction to a minimum of 90 percent relative compaction. This is with the exception of the upper 12 inches under pavement areas where the minimum relative compaction should be 95 percent. Jetting of the native soil is not recommended.
- 8. Testing and Observation:** During grading, tests and observations should be performed by a representative of this firm to verify that the grading is performed per the project specifications. Density testing should be performed per the current ASTM D1556 or ASTM D6938 test methods. The minimum acceptable degree of compaction should be 90 percent of the maximum dry density, based on ASTM D1557, except where superseded by more stringent requirements, such as beneath

pavement. Where testing indicates insufficient density, additional compactive effort should be applied until retesting indicates satisfactory compaction.

Limitations

The findings and recommendations presented in this report are based on the soil conditions encountered at the boring locations. Should conditions be encountered during grading that appear to be different than those indicated by this report, this office should be notified.

This report was prepared for STK Architecture, Inc. for their use in the design of the proposed South Perris fire station. This report may only be used by STK Architecture, Inc for this purpose. The use of this report by parties or for other purposes is not authorized without written permission by Inland Foundation Engineering, Inc. Inland Foundation Engineering, Inc. will not be liable for any projects connected with the unauthorized use of this report.

The recommendations of this report are considered to be preliminary. The final design parameters may only be determined or confirmed at the completion of site grading on the basis of observations made during the site grading operation. To this extent, this report is not considered to be complete until the completion of both the design process and the site preparation.

The information in this report represents professional opinions that have been developed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities. No warranty, express or implied, is made.

References

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California Building Standards Commission, 2022, California Building Code (CBC), California Code of Regulations, Title 24, Part 2, Volume 2.

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Terra Geosciences, Geologic Hazards Report, South Perris Fire Station CIP F077, Project No. 254143-1, dated August 6, 2025

United States Geologic Survey, Perris 7.5' Quadrangle (2021)

***APPENDIX A –
Site Exploration***

Appendix A

Site Exploration

Six exploratory borings were drilled at the approximate locations shown on Figure A-9. The materials encountered during drilling were logged by a staff geologist. Boring logs are included with this report as Figures A-3 through A-8.

Representative undisturbed soil samples were obtained within the borings by driving a modified California split spoon sampler and Standard Penetration Test (SPT) sampler. Representative bulk soil samples were also obtained from the excavation cuttings. Samples were placed in moisture sealed containers and transported to our laboratory for further testing and evaluation. Laboratory tests results are discussed and included in Appendix B.

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D2487)						
PRIMARY DIVISIONS			GROUP SYMBOLS		SECONDARY DIVISIONS	
COARSE GRAINED SOILS MORE THAN HALF OF MATERIALS IS LARGER THAN #200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN #4 SIEVE	CLEAN GRAVELS (LESS THAN) 5% FINES	GW		WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
			GP		POORLY GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
		GRAVEL WITH FINES	GM		SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	
			GC		CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN #4 SIEVE	CLEAN SANDS (LESS THAN) 5% FINES	SW		WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	
			SP		POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES	
		SANDS WITH FINES	SM		SILTY SANDS, SAND-SILT MIXTURES	
			SC		CLAYEY SANDS, SAND-CLAY MIXTURES	
FINE GRAINED SOILS MORE THAN HALF OF MATERIALS IS SMALLER THAN #200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50		ML		INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS	
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
			OL		ORGANIC SILTS AND ORGANIC SILT-CLAYS OF LOW PLASTICITY	
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50		MH		INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDS OR SILTS, ELASTIC SILTS	
			CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
			OH		ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
	HIGHLY ORGANIC SOILS		PT		PEAT, MUCK AND OTHER HIGHLY ORGANIC SOILS	
TYPICAL FORMATIONAL MATERIALS	SANDSTONES		SS			
	SILTSTONES		SH			
	CLAYSTONES		CS			
	LIMESTONES		LS			
	SHALE		SL			

CONSISTENCY CRITERIA BASES ON FIELD TESTS

RELATIVE DENSITY – COARSE – GRAIN SOIL			CONSISTENCY – FINE-GRAIN SOIL		TORVANE	POCKET ** PENETROMETER	* NUMBER OF BLOWS OF 140 POUND HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1 3/8 INCH I.D.) SPLIT BARREL SAMPLER (ASTM -1586 STANDARD PENETRATION TEST)
RELATIVE DENSITY	SPT * (# BLOWS/FT)	RELATIVE DENSITY (%)	CONSISTENCY	SPT* (# BLOWS/FT)	UNDRAINED SHEAR STRENGTH (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	
VERY LOOSE	<4	0-15	Very Soft	<2	<0.13	<0.25	
LOOSE	4-10	15-35	Soft	2-4	0.13-0.25	0.25-0.5	
MEDIUM DENSE	10-30	35-65	Medium Stiff	4-8	0.25-0.5	0.5-1.0	
DENSE	30-50	65-85	Stiff	8-15	0.5-1.0	1.0-2.0	
VERY DENSE	>50	85-100	Very Stiff	15-30	1.0-2.0	2.0-4.0	** UNCONFINED COMPRESSIVE STRENGTH IN TONS/SQ.FT. READ FROM POCKET PENETROMETER
			Hard	>30	>2.0	>4.0	

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
DRY	Absence of moisture, dusty, dry to the touch
MOIST	Damp but no visible water
WET	Visible free water, usually soil is below water table

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbled or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

EXPLANATION OF LOGS

LOG OF BORING B-01

DRILLING RIG	<u>Mobile B-61</u>	DATE DRILLED	<u>7/31/25</u>	HAMMER TYPE	<u>Auto-Trip</u>
DRILLING METHOD	<u>Rotary Auger</u>	HAMMER WEIGHT	<u>140-lb.</u>	HAMMER DROP	<u>30-inches</u>
LOGGED BY	<u>FWC</u>	BORING DIAMETER	<u>8-inches</u>		
GROUND ELEVATION	<u>+/-</u>				

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered and is representative of interpretations made during drilling. Contrasting data derived from laboratory analysis may not be reflected in these representations.	BULK SAMPLE	DRIVE SAMPLE	SAMPLE TYPE	BLOW COUNTS /6"	MOISTURE (%)	DRY UNIT WT. (pcf)
5	SC		CLAYEY SAND , very fine to fine, dark grayish-brown (10YR 4/2), moist, very loose to dense.			AU			
			SANDY CLAY , grayish-brown (10YR 5/2) to dark yellowish-brown (10YR 4/4), moist, stiff, caliche.		X	AU SS	22 36	13	112
	CL				X	SS	12 10	14	112
10			CLAYEY SAND , very fine to fine, light olive-brown (2.5Y 5/4), moist, medium dense.		X	SS AU	10 13	27	96
	SC				X	SS	7 11	7	121
15	SC-SM		SILTY, CLAYEY SAND , fine to very coarse, olive (5Y 5/3), moist, medium dense to dense, moderately cemented.		X	SS	16 29	14	116
20			SILTY SAND , with trace clay, fine to coarse, dark yellowish-brown (10YR 4/4), moist, dense.		X	SPT	19 18	9	
	SM				X	SPT	16 23	13	
25									
			End of boring at 26.5 feet. No groundwater encountered. Backfilled with native soil.						



CLIENT	<u>STK Architecture, Inc.</u>
PROJECT NAME	<u>South Perris Fire Station CIP F077</u>
PROJECT LOCATION	<u>Murrieta Rd</u>
	<u>Perris, CA</u>
PROJECT NUMBER	<u>S168-196</u>

FIGURE NO.

A-3

LOG OF BORING B-02

DRILLING RIG Mobile B-61
 DRILLING METHOD Rotary Auger
 LOGGED BY FWC
 GROUND ELEVATION +/-

DATE DRILLED 7/31/25

HAMMER TYPE Auto-Trip
 HAMMER WEIGHT 140-lb.
 HAMMER DROP 30-inches
 BORING DIAMETER 8-inches

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS				BULK SAMPLE	DRIVE SAMPLE	SAMPLE TYPE	BLOW COUNTS /6"	MOISTURE (%)	DRY UNIT WT. (pcf)	
			This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered and is representative of interpretations made during drilling. Contrasting data derived from laboratory analysis may not be reflected in these representations.										
5	SM		SILTY SAND , with trace clay, very fine to fine, dark grayish-brown (10YR 4/2), slightly moist, very loose to medium dense.						AU	4	12	106	
	SC								SS				9
	CL								SS				16
10	SC		SANDY CLAY , olive-brown (2.5Y 4/3), moist, very stiff, caliche, moderately cemented.						SS	12	19	112	
									AU	19	14	115	
									SS	9	15	9	127
15	SM		SILTY SAND , fine to coarse, dark yellowish-brown (10YR 4/4), moist, dense, indurated, moderately cemented.						SS	34	16	122	
	SS								50/4"				
	SM								AU				
20	SW-SM		SAND with SILT , fine to coarse, dark yellowish-brown (10YR 4/4), slightly moist, dense.						SS	26	6	119	
									SS	31			
									SPT	19	22	6	
30	SM		SILTY SAND , fine to medium, dark yellowish-brown (10YR 4/4), moist, dense.						SPT	14	17		
	SC								SPT	24			
	SM								SPT	26	10		
35	SM		SILTY SAND , with trace clay, fine to medium, brown (7.5YR 5/3), moist, dense.						SPT	30	16		
									SPT	36			
									SPT	27	13		
40	SC-SM		SILTY, CLAYEY SAND , very fine to fine, dark yellowish-brown (10YR 4/4), moist, dense.						SPT	16	15		
	SM								SPT	30			
	SP-SM								SPT	34			
45	SC		SAND with SILT , fine to coarse, dark yellowish-brown (10YR 4/4), slightly moist, very dense.						SPT	27	13		
									SM	SPT	41		
									SM	SPT			
50	SM		CLAYEY SAND , very fine to fine, olive, wet, very dense.						SPT				
									SPT				
									SPT				
End of boring at 51.5 feet. Groundwater initially encountered at 45.5 feet. Final groundwater at 40.5 feet. Mottling encountered at 35 feet. Backfilled with native soil.													



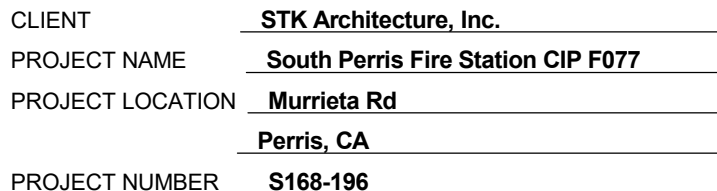
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FIGURE NO.

A-4

LOG OF BORING B-03			
DRILLING RIG	<u>Mobile B-61</u>	DATE DRILLED	<u>7/31/25</u>
DRILLING METHOD	<u>Rotary Auger</u>	HAMMER TYPE	<u>Auto-Trip</u>
LOGGED BY	<u>FWC</u>	HAMMER WEIGHT	<u>140-lb.</u>
GROUND ELEVATION	<u>+/-</u>	HAMMER DROP	<u>30-inches</u>
		BORING DIAMETER	<u>8-inches</u>

SUMMARY OF SUBSURFACE CONDITIONS									
DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered and is representative of interpretations made during drilling. Contrasting data derived from laboratory analysis may not be reflected in these representations.	BULK SAMPLE	DRIVE SAMPLE	SAMPLE TYPE	BLOW COUNTS /6"	MOISTURE (%)	DRY UNIT WT. (pcf)
	SM		SILTY SAND , with trace clay, very fine to fine, dark grayish-brown, slightly moist, very loose to medium dense.						
	SC		CLAYEY SAND , very fine to fine, dark grayish-brown (10YR 4/2), moist, dense, moderately cemented.						
5	SC		CLAYEY SAND , very fine to fine, brown (10YR 5/3), moist, medium dense, caliche, moderately cemented.		X	SS	20 38	10	123
	SC				X	SS	16 18	4	123
10	SC		CLAYEY SAND , very fine to fine, brown (10YR 5/3), moist, very dense.		X	SS	15 16	13	119
					X	SS	15 31	18	115
15	SC-SM		SILTY, CLAYEY SAND , fine to very coarse, yellowish-brown (10YR 5/4), moist, very dense, moderately cemented.		X	SS	26 52	10	129
20	SM		SILTY SAND , with trace clay, fine to very coarse, yellowish-brown (10YR 5/4), moist, dense.		X	SS	28 41	9	127
25	SM		SILTY SAND , with trace gravel, fine to coarse, yellowish-brown (10YR 5/4), moist, dense to very dense.		X	SS	31 43	7	120
			End of boring at 26.5 feet. No groundwater encountered. Backfilled with native soil.						



A-5

LOG OF BORING B-04

DRILLING RIG Mobile B-61
 DRILLING METHOD Rotary Auger
 LOGGED BY FWC
 GROUND ELEVATION +/-

DATE DRILLED 7/31/25

HAMMER TYPE Auto-Trip
 HAMMER WEIGHT 140-lb.
 HAMMER DROP 30-inches
 BORING DIAMETER 8-inches

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered and is representative of interpretations made during drilling. Contrasting data derived from laboratory analysis may not be reflected in these representations.	BULK SAMPLE	DRIVE SAMPLE	SAMPLE TYPE	BLOW COUNTS /6"	MOISTURE (%)	DRY UNIT WT. (pcf)	
5	SC		ALFALFA CLAYEY SAND , very fine to fine, dark gray-brown, slightly moist to moist, loose to medium dense.			AU SS	9 16	11	94	
	CL		SANDY CLAY , grayish-brown, moist, stiff.							
	ML		SANDY SILT , dark grayish-brown, moist, stiff, porous, rootlets.			SS	28 40	21	108	
	CL		SANDY CLAY , dark grayish-brown (10YR 4/2), moist, hard, caliche, indurated.							
10	SC		CLAYEY SAND , very fine to fine, yellowish-brown (10YR 5/6), moist, medium dense, caliche.			SS	8 12	18	110	
15	SC-SM			SILTY, CLAYEY SAND , fine to coarse, yellowish-brown (10YR 5/6), moist, medium dense.			SS	14 20	14	119
							SS	14 18	10	
20	SM		SILTY SAND , with trace clay, fine to coarse, yellowish-brown (10YR 5/6), moist, medium dense to dense.			SPT	13 18	11		
	SM		SILTY SAND , with trace clay, fine to medium, olive, moist, medium dense.							
25	SW			SAND , fine to coarse, yellowish-brown (10YR 5/6), slightly moist, dense.			SPT	15 22	19	
	SC			CLAYEY SAND , very fine to fine, strong brown (7.5YR 4/6), moist, dense.						
			End of boring at 26.5 feet. No groundwater encountered. Backfilled with native soils.							



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FIGURE NO.

A-6

LOG OF BORING B-05

DRILLING RIG Mobile B-61
 DRILLING METHOD Rotary Auger
 LOGGED BY FWC
 GROUND ELEVATION +/-

DATE DRILLED 7/31/25

HAMMER TYPE Auto-Trip
 HAMMER WEIGHT 140-lb.
 HAMMER DROP 30-inches
 BORING DIAMETER 8-inches

SUMMARY OF SUBSURFACE CONDITIONS										BULK SAMPLE	DRIVE SAMPLE	SAMPLE TYPE	BLOW COUNTS /6"	MOISTURE (%)	DRY UNIT WT. (pcf)	
DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered and is representative of interpretations made during drilling. Contrasting data derived from laboratory analysis may not be reflected in these representations.													
5	SC		ALFALFA									AU				
	CLAYEY SAND , very fine to fine, dark grayish-brown (10YR 4/2), moist, very loose.									SS	2 3	17	104			
10	CL		SANDY CLAY , yellowish-brown (10YR 5/4), moist, hard, caliche.									SS	17 26	26	103	
	CLAYEY SAND , very fine to fine, strong brown (7.5YR 4/6), moist to very moist, medium dense, caliche, with thin interbeds of silty sand.									AU SS	26 23	16	115			
15	SC		CLAYEY SAND , very fine to fine, strong brown (7.5YR 4/6), moist, medium dense.									SS	8 12	25	104	
	SM		SILTY SAND , fine to coarse, dark yellowish-brown (10YR 4/4), moist, medium dense.									AU SS	20 18	8	127	
20	SC-SM		SILTY, CLAYEY SAND , very fine to medium, dark yellowish-brown (10YR 4/4), moist, medium dense to dense.									AU SS	32 52	7	125	
	SM		SILTY SAND , fine to coarse, dark yellowish-brown (10YR 4/6), moist, dense to very dense.									SS	30 46	10	126	
25	SC		CLAYEY SAND , very fine to fine, dark yellowish-brown (10YR 4/6), moist, dense.													
	SC		CLAYEY SAND , very fine to fine, brown ((7.5YR 4/6), mmoist, medium dense to dense.								✕	SPT	13 18	18		
30	SM		SILTY SAND , with trace clay, fine to medium, strong brown (7.5YR 4/6), moist, very dense.								✕	SPT	20 32	11		
											✕	SPT	24 36	10		
35	SM										✕	SPT	28 35	14		
											✕	SPT	24 31	14		
45	SW		SAND , fine to coarse, mottled grayish-brown, wet, very dense.													
	SC		CLAYEY SAND , very fine to medium, brown (10YR 4/3), wet, very dense.								✕	SPT	19 44	19		
50			End of boring at 51.5 feet. Groundwater initially encountered at 46 feet. Final groundwater at 42 feet. Mottling encountered at 41 feet. Backfilled with native soil.													



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 PROJECT LOCATION Murrieta Rd
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FIGURE NO.

A-7

LOG OF BORING B-06

DRILLING RIG	<u>Mobile B-61</u>	DATE DRILLED	<u>7/31/25</u>	HAMMER TYPE	<u>Auto-Trip</u>
DRILLING METHOD	<u>Rotary Auger</u>	HAMMER WEIGHT	<u>140-lb.</u>	HAMMER DROP	<u>30-inches</u>
LOGGED BY	<u>FWC</u>	BORING DIAMETER	<u>8-inches</u>		
GROUND ELEVATION	<u>+/-</u>				

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered and is representative of interpretations made during drilling. Contrasting data derived from laboratory analysis may not be reflected in these representations.	BULK SAMPLE	DRIVE SAMPLE	SAMPLE TYPE	BLOW COUNTS /6"	MOISTURE (%)	DRY UNIT WT. (pcf)
	SC		CLAYEY SAND , very fine to fine, dark grayish-brown (10YR 4/2), slightly moist, loose to medium dense, rootlets.			AU			
	SC		CLAYEY SAND , very fine to fine, dark grayish-brown (10YR 4/2), moist, medium dense.			AU SS	15 17	9	121
5									
	SM		SILTY SAND , with trace clay, very fine to fine, dark yellowish-brown (10YR 4/4), slightly moist, medium dense, caliche.			SS	12 14	9	110
	SM					SS	17 20	16	112
10									
	SC		CLAYEY SAND , very fine to fine, yellowish-brown (10YR 5/4), moist, loose to medium dense, caliche.			SS	6 9	18	106
	SM		SILTY SAND , with trace clay, fine to medium, yellowish-brown (10YR 5/4), moist, medium dense, moderately cemennted.			SS	12 19	10	127
15									
			End of boring at 17 feet. No groundwater encountered. Backfilled with native soil.						

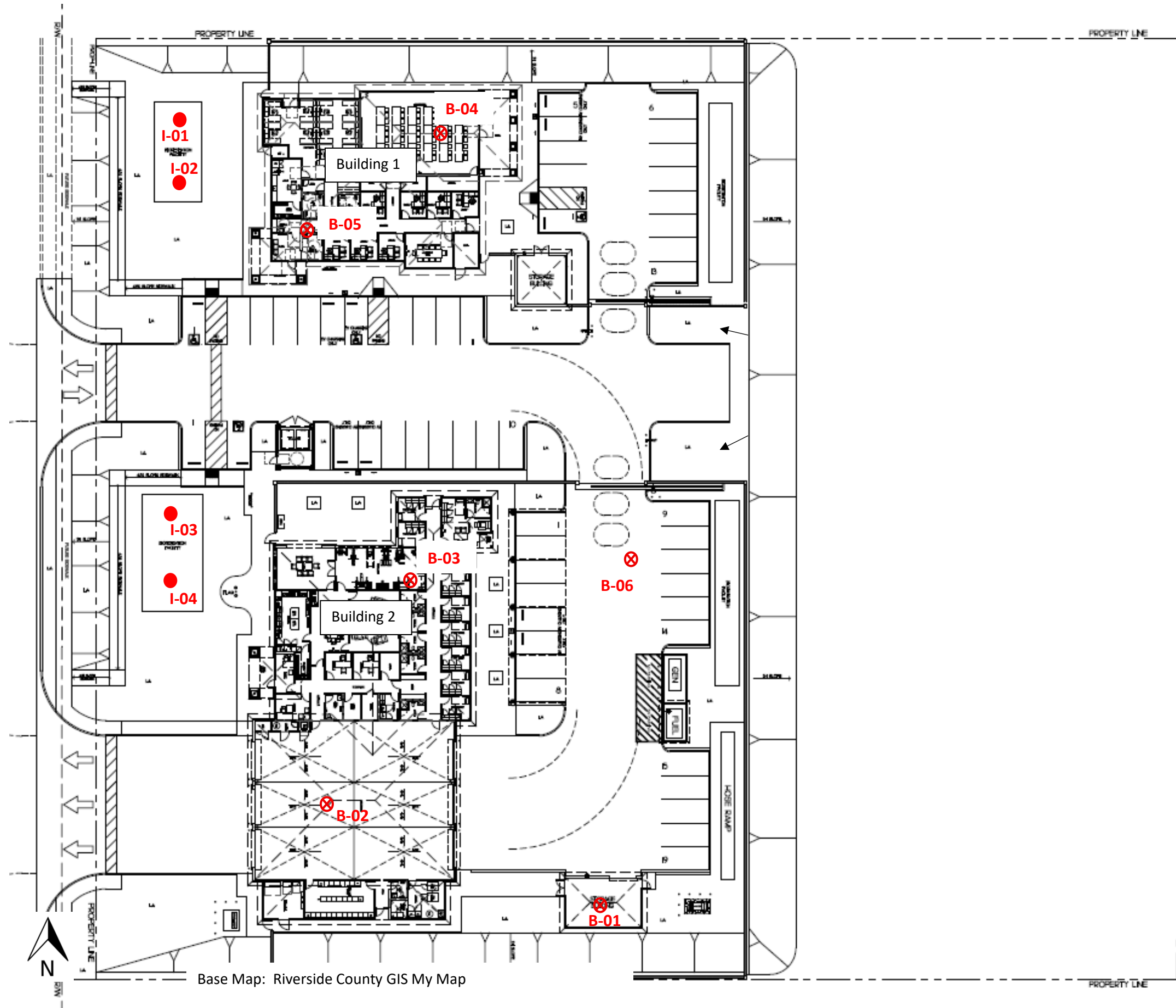


CLIENT	<u>STK Architecture, Inc.</u>
PROJECT NAME	<u>South Perris Fire Station CIP F077</u>
PROJECT LOCATION	<u>Murrieta Rd</u> <u>Perris, CA</u>
PROJECT NUMBER	<u>S168-196</u>

FIGURE NO.

A-8

SITE PLAN
South Perris Fire Station
Murrieta Road
Perris, California



- Approximate Location of Infiltration Test
- ⊗ Approximate Boring Location

IFE Inland Foundation Engineering, Inc.
1310 S. Santa Fe Avenue, San Jacinto, CA 92583 | (951) 654-1555

Figure
No. A-9

STK Architecture, Inc.
South Perri Fire Station
Murrieta Road, Perris, CA

Drawn By: SD
Scale 1" = 40'

Project No. S168-196
Date: September 2025

***APPENDIX B –
Laboratory Testing***

Appendix B

Laboratory Testing

Representative soil samples obtained from our borings were delivered to our laboratory. Descriptions of the tests performed are provided below. Results of the testing are appended.

Unit Weight and Moisture Content: Ring samples were weighed and measured to evaluate their unit weight. A small portion of each sample was then tested for moisture content. The testing was performed per ASTM D2937 and D2216. The results of this testing are shown on the boring logs (Figures A-3 through A-8).

Sieve Analysis: Seven soil samples were selected for sieve analysis testing in accordance with ASTM D6913. These tests provide information for classifying the soil in accordance with the Unified Classification System. This classification system categorizes the soil into groups having similar engineering characteristics. The results of the testing are shown on Figures B-3 and B-4.

Plastic Index: Seven samples were selected for plastic index testing in accordance with ASTM D4318. These tests provide information regarding soil plasticity and are also used for developing classifications of the soil in accordance with the Unified Classification System. The results of the testing are shown on Figures B-3 and B-4.

Maximum Density-Optimum Moisture: Two samples were selected for maximum density testing in accordance with ASTM D1557. The maximum density is compared to the in-situ density of the soil to evaluate the relative compaction of the soil. The results of the testing are shown on Figure B-5.

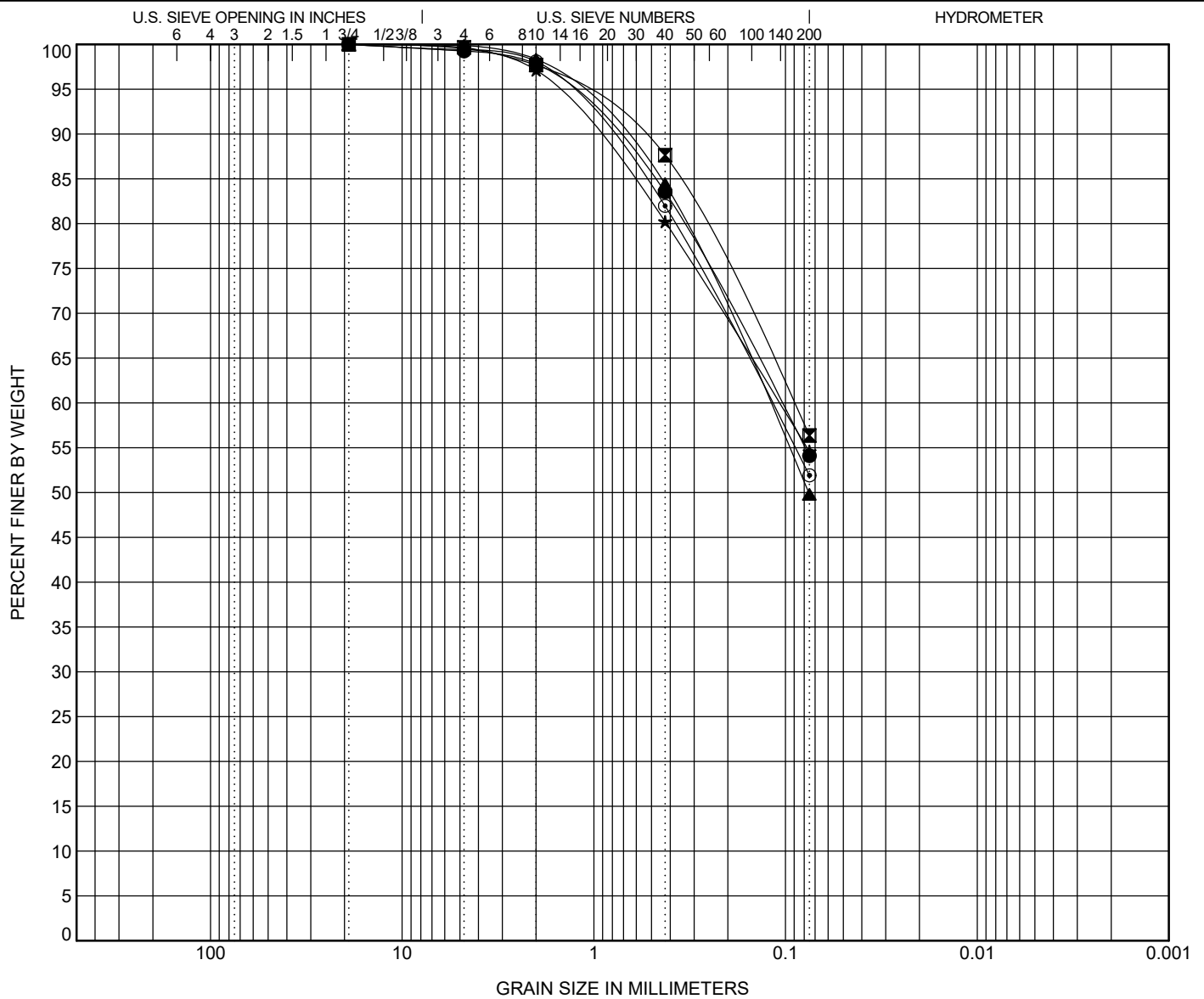
Consolidation Testing: Two samples were selected for consolidation testing in accordance with ASTM D2435. This test is used to evaluate the magnitude and rate of settlement of a structure or earth fill. The results of this testing are presented graphically on Figure B-6.

Direct Shear Strength: Two samples were selected and transported to AP Engineering and Testing in Pomona, California for direct shear strength testing in accordance with ASTM D3080. This testing measures the shear strength of the soil under various normal pressures and is used to develop parameters for foundation bearing capacity and lateral earth pressure. Test results are shown on Figures B-7 and B-8.

Corrosion Testing: One sample was selected and transported to AP Engineering and Testing in Pomona, California to evaluate the concentration of soluble sulfates and chlorides, pH level, and resistivity of and within the on-site soils. The test results are shown on Figure B-9.

R-value: One sample was selected for R-value and transported to AP Engineering and Testing in Pomona, California for testing in accordance with ASTM D2844. This test measures the potential strength of subgrade, subbase, and base course materials for use in pavements. Test results are shown on Figure No. B-10.

IFE SIEVE ANALYSIS - GINT STD US LAB.GDT - 9/2/25 13:46 - P:\S168\168-196 SOUTH PERRIS FS\GINT.GPJ



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SAMPLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● B-01	2.8	SANDY LEAN CLAY(CL)					31	20	11		
☒ B-02	4.0	SANDY LEAN CLAY(CL)					34	17	17		
▲ B-02	8.3	CLAYEY SAND(SC)					30	15	15		
★ B-04	3.5	SANDY SILT(ML)					38	27	11		
◎ B-05	3.5	SANDY LEAN CLAY(CL)					29	20	9		
BOREHOLE	DEPTH	D100	D90	D50	D10	%Gravel	%Sand	%Silt		%Clay	
● B-01	2.8	19	0.857			0.7	45.2	54.1			
☒ B-02	4.0	19	0.611			0.3	43.3	56.4			
▲ B-02	8.3	19	0.79	0.076		0.1	50.1	49.8			
★ B-04	3.5	19	1.041			0.5	44.9	54.6			
◎ B-05	3.5	19	0.919			0.6	47.5	51.9			

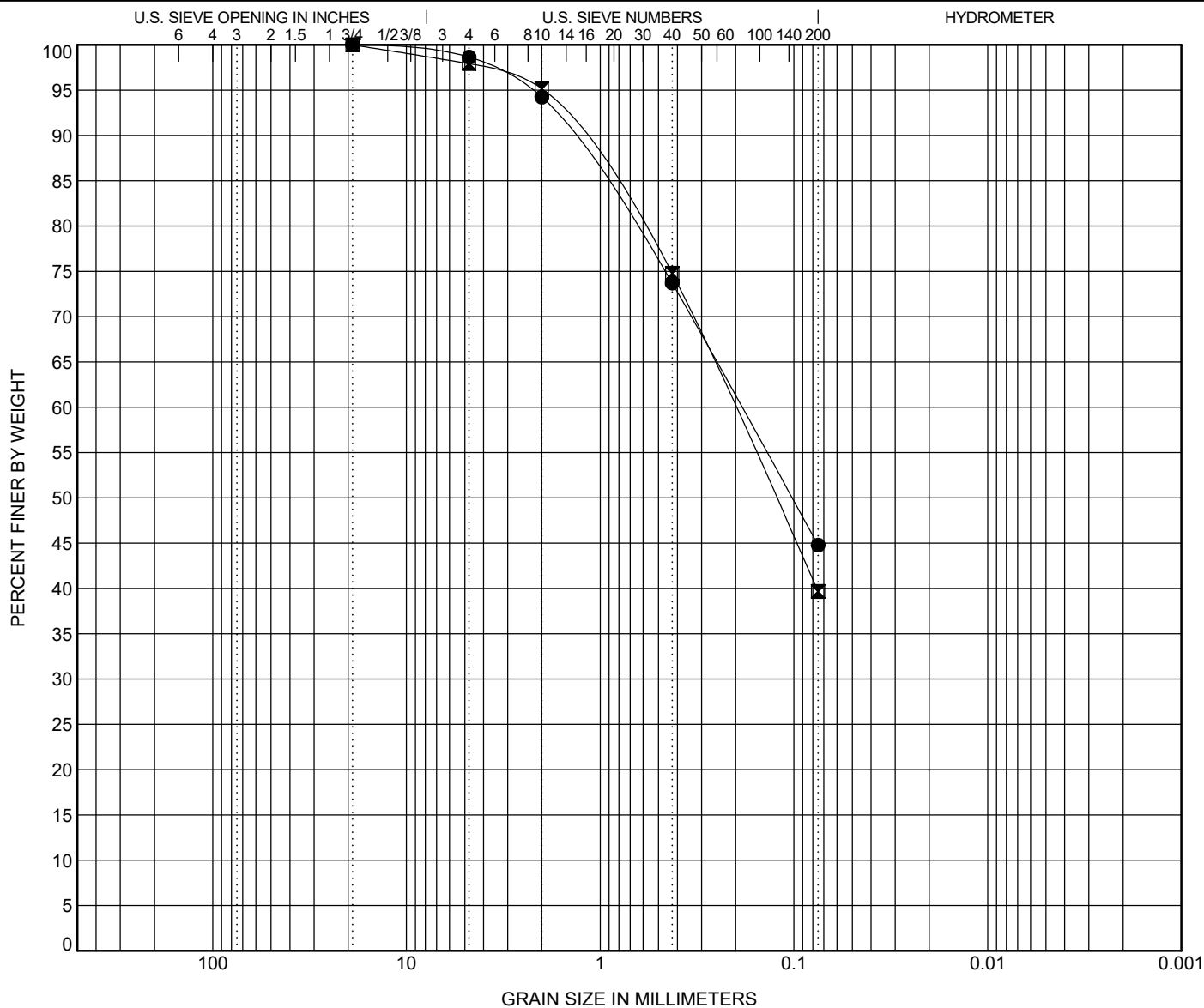
GRADATION CURVES (ASTM D6913, ASTM D4318)

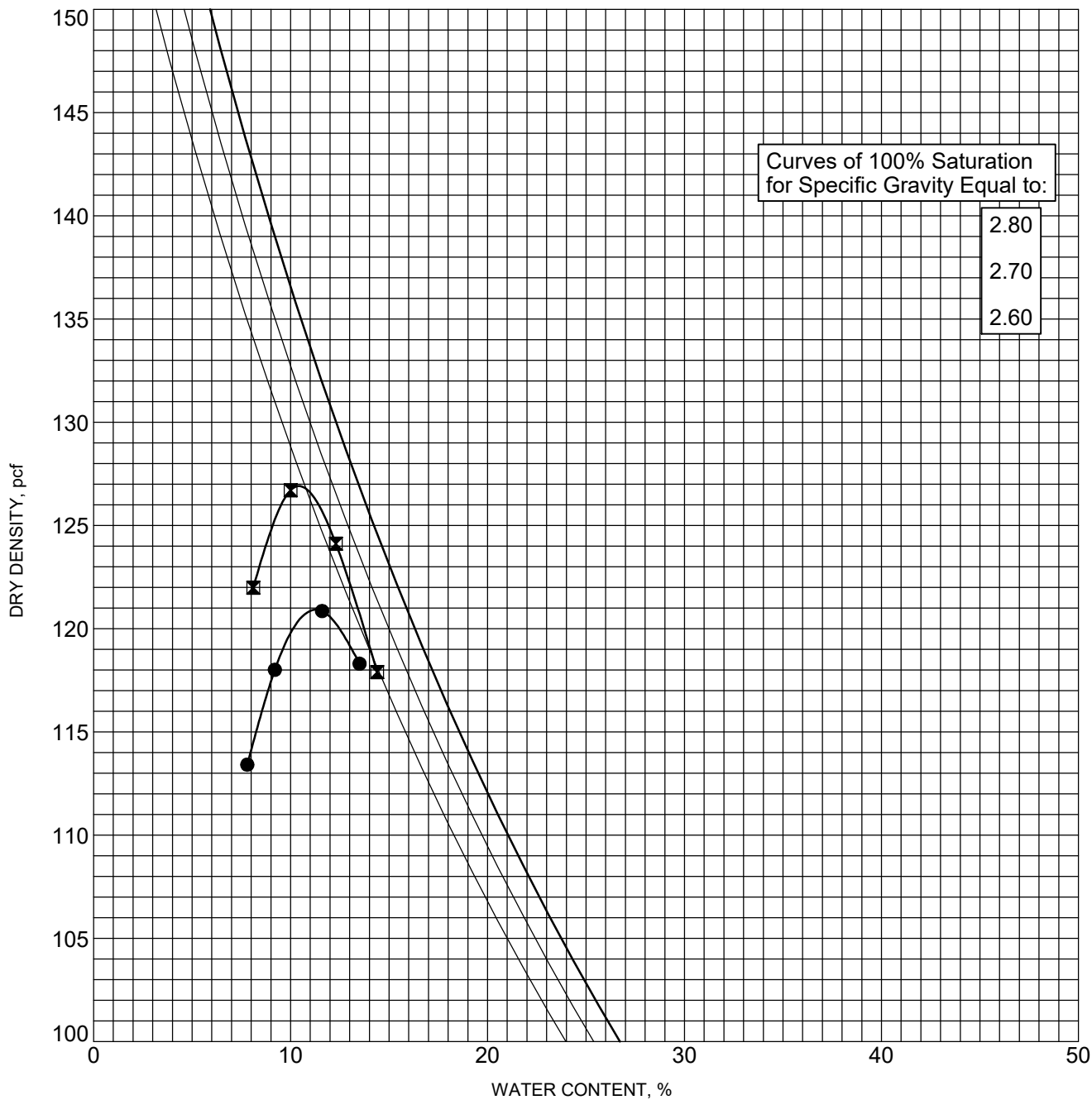
INLAND FOUNDATION ENGINEERING, INC.

FIGURE NO. B-3

CLIENT	STK Architecture, Inc.	PROJECT NAME	South Perris Fire Station CIP F077
PROJECT NUMBER	S168-196	PROJECT LOCATION	Murrieta Rd
			Perris, CA

IFE SIEVE ANALYSIS - GINT STD US LAB.GDT - 9/2/25 13:46 - P:\S168\S168-196 SOUTH PERRIS FS\GINT.GPJ





BOREHOLE	DEPTH	Description of Materials	Max DD	Optimum WC
● B-02	1.5	CLAYEY SAND(SC)	120.9 PCF	11.3 %
☒ B-05	0.3	CLAYEY SAND(SC)	126.9 PCF	10.5 %

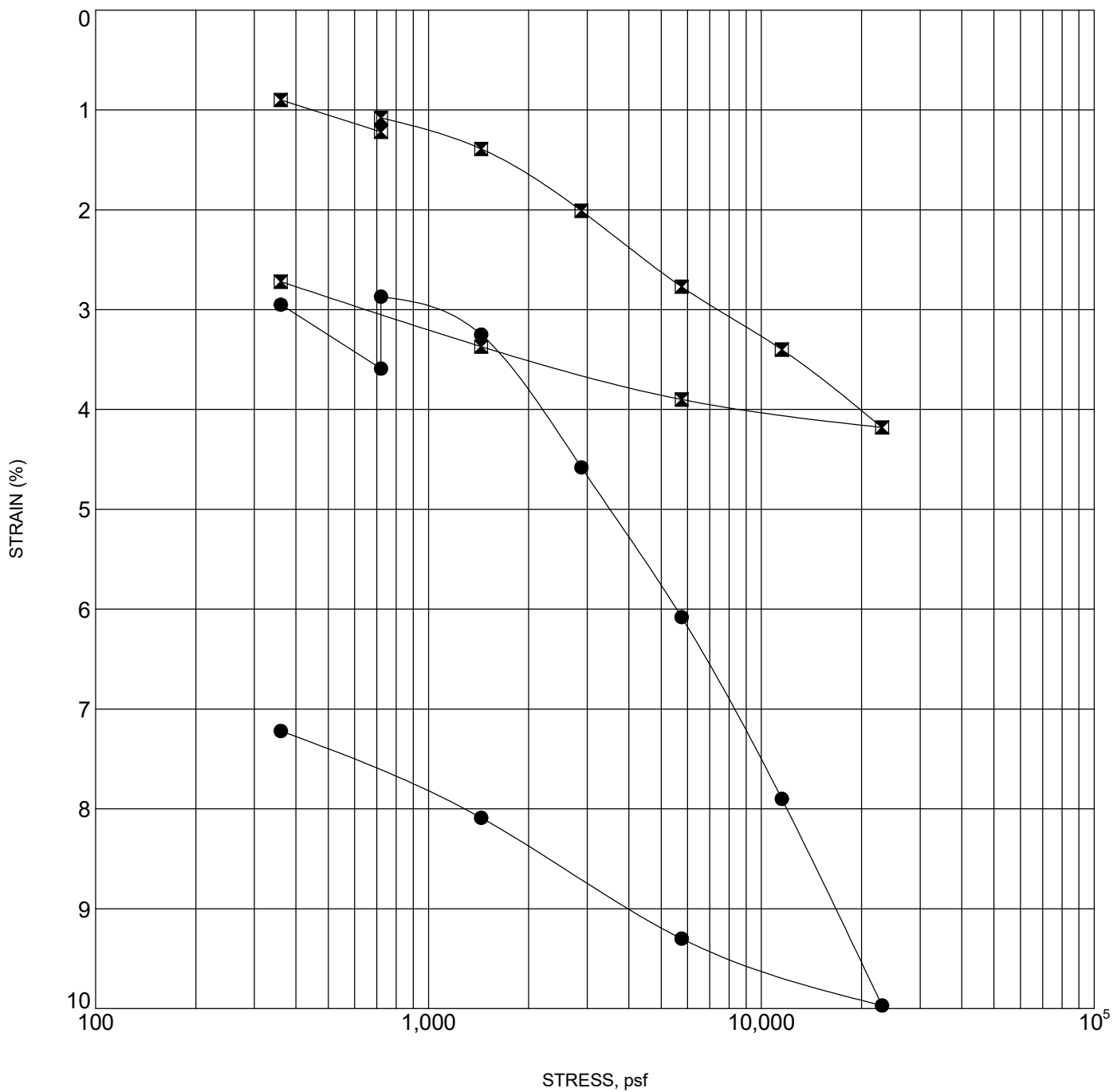
INLAND FOUNDATION ENGINEERING, INC.

MOISTURE-DENSITY CURVES (ASTM D1557)

CLIENT	<u>STK Architecture, Inc.</u>	PROJECT NAME	<u>South Perris Fire Station CIP F077</u>
PROJECT NUMBER	<u>S168-196</u>	PROJECT LOCATION	<u>Murrieta Rd</u>
			<u>Perris, CA</u>

FIGURE NO. B-5

IFE CONSOLIDATION - GINT STD US LAB.GDT - 9/10/25 11:10 - P:\S168\S168-196 SOUTH PERRIS FSIGINT.GPJ



BOREHOLE	DEPTH	Classification	γ_d	MC%
● B-03	6.5	CLAYEY SAND(SC)	115	13
⊠ B-05	7.5	CLAYEY SAND(SC)		

CONSOLIDATION TEST (ASTM D2435)

INLAND FOUNDATION ENGINEERING, INC.

FIGURE NO. B-6

CLIENT	STK Architecture, Inc.	PROJECT NAME	South Perris Fire Station CIP F077
PROJECT NUMBER	S168-196	PROJECT LOCATION	Murrieta Rd
			Perris, CA

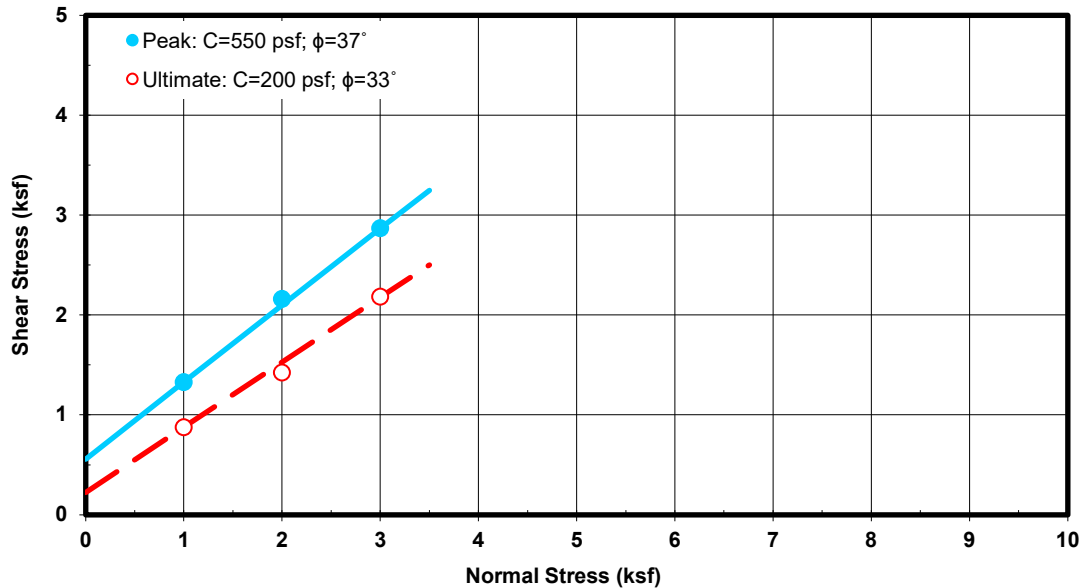
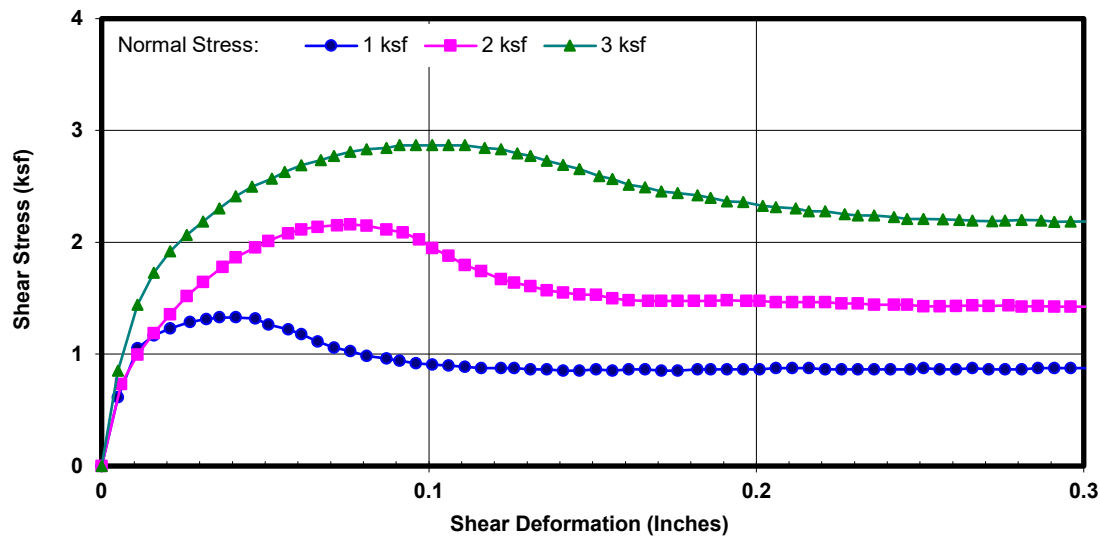


DIRECT SHEAR TEST RESULTS ASTM D 3080

Project Name: STK CIP FO77
Project No.: S168-196
Boring No.: B-03
Sample No.: - Depth (ft): 3.5-4.5
Sample Type: Mod. Cal.
Soil Description: Sandy Silt
Test Condition: Inundated Shear Type: Regular

Tested By: ST Date: 09/02/25
Computed By: JP Date: 09/08/25
Checked by: AP Date: 09/08/25

Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Initial Degree Saturation (%)	Final Degree Saturation (%)	Normal Stress (ksf)	Peak Shear Stress (ksf)	Ultimate Shear Stress (ksf)
133.2	119.3	11.6	15.2	76	100	1	1.328	0.875
						2	2.160	1.424
						3	2.868	2.184



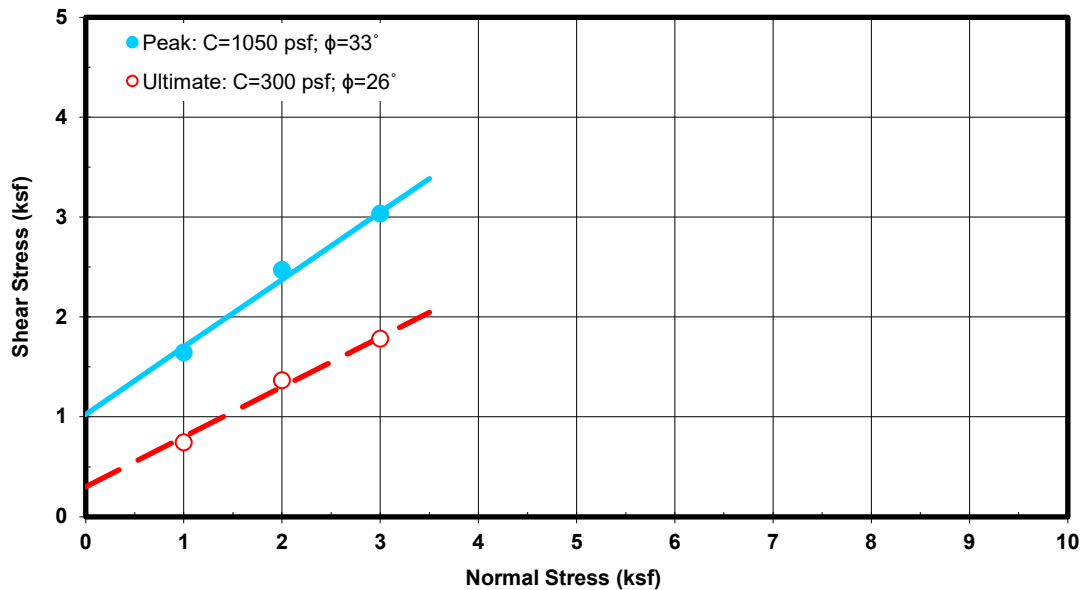
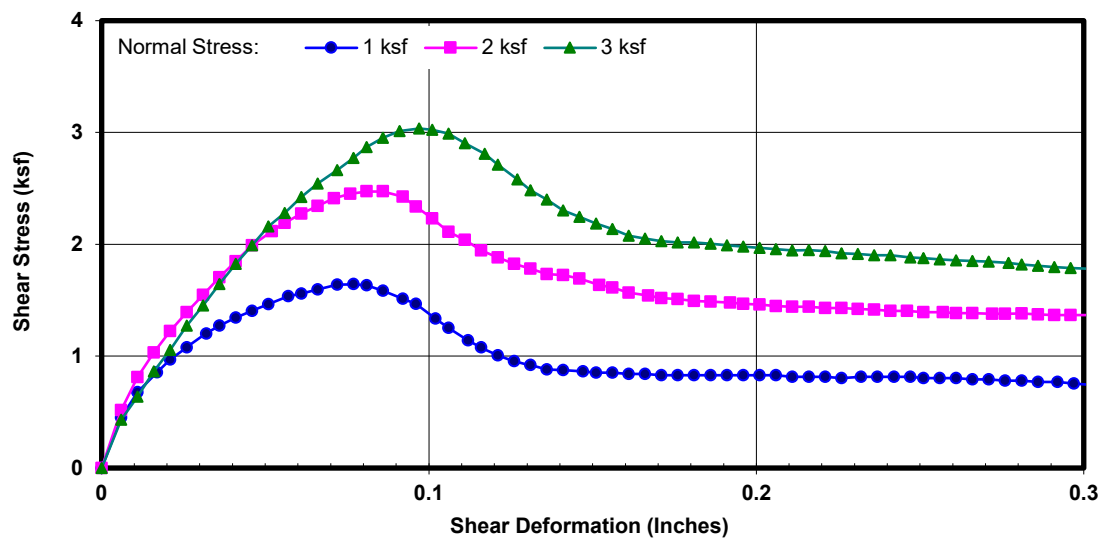


DIRECT SHEAR TEST RESULTS ASTM D 3080

Project Name: STK CIP FO77
Project No.: S168-196
Boring No.: B-04
Sample No.: - Depth (ft): 6.5-7.5
Sample Type: Mod. Cal.
Soil Description: Clay w/sand
Test Condition: Inundated Shear Type: Regular

Tested By: ST Date: 09/02/25
Computed By: JP Date: 09/08/25
Checked by: AP Date: 09/08/25

Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Initial Degree Saturation (%)	Final Degree Saturation (%)	Normal Stress (ksf)	Peak Shear Stress (ksf)	Ultimate Shear Stress (ksf)
117.4	100.1	17.3	25.2	68	100	1	1.644	0.744
						2	2.472	1.368
						3	3.036	1.782



**AP Engineering and Testing, Inc.**

DBE | MBE | SBE

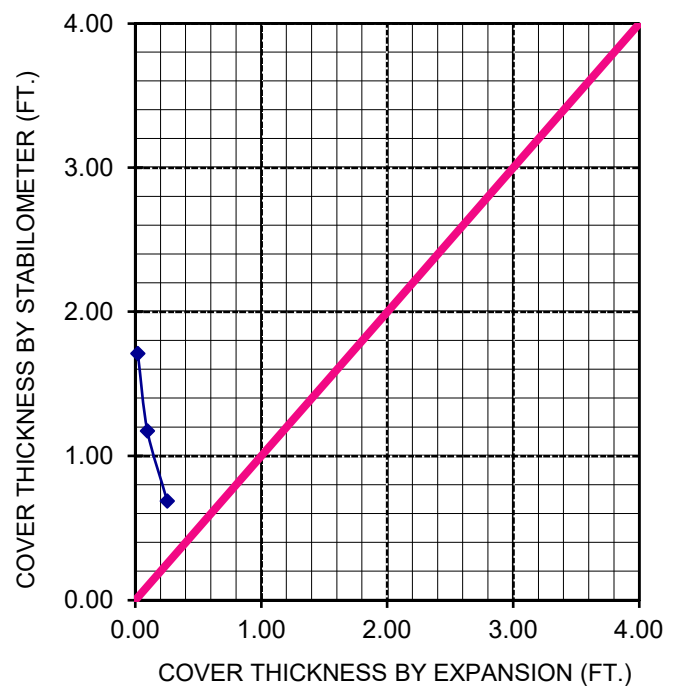
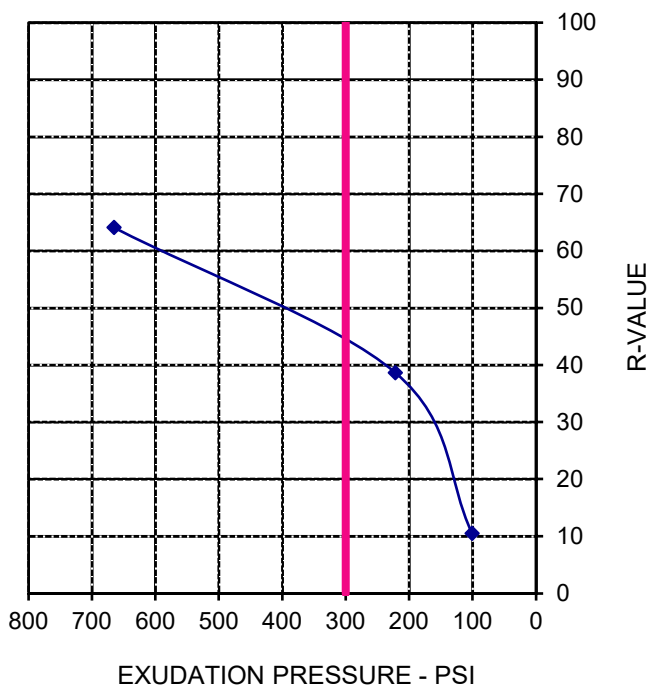
2607 Pomona Boulevard | Pomona, CA 91768

t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com**R-VALUE TEST DATA**

ASTM D2844

Project Name: STK CIP FO77Tested By: STDate: 08/27/25Project Number: S168-196Computed By: KMDate: 08/28/25Boring No.: B-6Checked By: APDate: 09/08/25Sample No.: - Depth (ft.): 0-2.5Location: N/ASoil Description: Sandy Silt w/trace clay

Mold Number	G	I	H		R-VALUE	By Exudation:	44
Water Added, g	139	113	96			By Expansion:	*N/A
Compact Moisture(%)	16.7	14.1	12.4			At Equilibrium:	44
Compaction Gage Pressure, psi	100	250	250			(by Exudation)	
Exudation Pressure, psi	101	222	665		Remarks	Gf = 1.34, and 0.0 % Retained on the 3/4" *Not Applicable	
Sample Height, Inches	2.6	2.5	2.5				
Gross Weight Mold, g	2911	2876	2906				
Tare Weight Mold, g	1825	1817	1835				
Net Sample Weight, g	1085	1059	1071				
Expansion, inchesx10 ⁻⁴	6	29	76				
Stability 2,000 (160 psi)	52/125	30/64	15/31				
Turns Displacement	6.17	5.95	5.83				
R-Value Uncorrected	10	39	64				
R-Value Corrected	11	39	64				
Dry Density, pcf	108.4	112.5	115.4				
Traffic Index	8.0	8.0	8.0				
G.E. by Stability	1.71	1.17	0.69				
G.E. by Expansion	0.02	0.10	0.25				



**AP Engineering and Testing, Inc.**

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2607 Pomona Boulevard | Pomona, CA 91768

t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com**CORROSION TEST RESULTS**Client Name: Inland Foundation EngineeringAP Job No.: 25-0864Project Name: STK CIP FO77Date: 09/04/25Project No.: S168-196

Boring No.	Sample No.	Depth (feet)	Soil Description	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
B-2	-	1.5-4	Silty Clay w/sand	1,552	8.4	32	28

NOTES: Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

APPENDIX C
Infiltration Testing

Appendix C

Infiltration Testing

Infiltration testing was conducted in general accordance with Appendix A of the Riverside County Low Impact Development BMP Design Handbook (2011). The shallow percolation test method was used per the Riverside County Department of Environmental Health guidelines. The percolation rates were converted to infiltration rates using the Porchet method.

Four percolation tests were performed at the locations shown on Figure A-9. The test holes were drilled on August 1, 2025 to depths of approximately 4 and 5 feet below existing ground surface. The test holes were approximately eight (8) inches in diameter. Gravel was placed in the bottom of each test hole. The test holes were then pre-soaked by inverting 5-gallons of water above the test hole.

Testing was conducted the same day following the presoak. For all tests, more than 6 inches of water seeped away twice consecutively in less than 25 minutes, which meets the sandy soil criteria. The tests were then run for an additional hour with measurements taken every 10 minutes.

The percolation rates were calculated to range from 4.0 to 17.1 minutes per inch (mpi). The percolation test rate was converted to an infiltration rate (I_c) using the Porchet method and the following equation:

$$I_c = \Delta H 60r / \Delta t (r + 2H_{avg})$$

Where:

r = Test Hole Radius (in.)

H_{avg} = Average Height of Water during Test Interval (in.)

ΔH = Change in Water Height during Test Interval (in.), and

Δt = Time Interval (in.)

The corresponding calculated infiltration rates (I_c) ranged from 0.3 to 1.2 inches per hour. These values exclude a factor of safety. Copies of the field test sheets are included with this report as Figures C-2 through C-5.

PERCOLATION TEST DATA SHEET – INFILTRATION TESTING

Project: South Perris FS				Project No.: S168-196		Date: 8/1/2025		
Test Hole No.: I-01				Tested By: Floyd Collins				
Depth of Test Hole (D_T): 60"				USCS Soil Classification: SC-SM				
Test Hole Dimensions (inches)				Length		Width		
Diameter (if round)= 8"		Sides (if rectangular) =						
Sandy Soil Criteria Test*								
Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6" (Y/N)	
1	7:48	8:13	25	36	44	8	Y	
2	8:19	8:41	24	36	46 $\frac{3}{4}$	7 $\frac{3}{4}$	Y	
3								
<p>*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".</p>								
Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	$\Delta D = \Delta H$ Change in Water Level (in.)	Perc. Rate min./in.	I_T $\frac{\Delta H}{\Delta t(r+2H)}_{Avg}$ 60r
1	8:41	8:51	10	36	38 $\frac{3}{4}$	2 $\frac{3}{4}$	3.6	
2	8:52	9:02	10	36	39	3	3.3	
3	9:03	9:13	10	36	38 $\frac{3}{4}$	2 $\frac{3}{4}$	3.6	
4	9:14	9:24	10	36	38 $\frac{1}{2}$	2 $\frac{1}{2}$	4.0	1.21
5	9:24	9:35	10	36	38 $\frac{1}{2}$	2 $\frac{1}{2}$	4.0	1.21
6	9:35	9:45	10	36	38 $\frac{1}{2}$	2 $\frac{1}{2}$	4.0	1.21
7								
8								
9								
10								
11								
12								
13								
14								
15								
<p>COMMENTS: Sunny clear (70° to 95°) Ground dry. First two measurements met sandy soil criteria. Pre-soaked on 7/31/25.</p>								

PERCOLATION TEST DATA SHEET – INFILTRATION TESTING

Project: South Perris FS				Project No.: S168-196		Date: 8/1/2025		
Test Hole No.: I-02				Tested By: Floyd Collins				
Depth of Test Hole (D_T): 48"				USCS Soil Classification: CL				
Test Hole Dimensions (inches)				Length		Width		
Diameter (if round)= 8"		Sides (if rectangular) =						
Sandy Soil Criteria Test*								
Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6" (Y/N)	
1	7:53	8:23	30	24	26 ½	2 ½	N	
2								
3								
<p>*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".</p>								
Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	ΔD=ΔH Change in Water Level (in.)	Perc. Rate min./in.	I_T $\frac{\Delta H 60r}{\Delta t(r+2H)}$ Avg
1	7:53	8:23	30	24	26 ½	2 ½	12	
2	8:25	8:55	30	24	26 ½	2 ½	12	
3	8:56	9:26	30	24	26	2	15	
4	9:26	9:56	30	24	26	2	15	
5	9:57	10:27	30	24	25 ¾	1 ¾	17.1	.28
6	10:28	10:58	30	24	25 ¾	1 ¾	17.1	.28
7	10:59	11:29	30	24	25 ¾	1 ¾	17.1	.28
8	11:29	11:59	30	24	25 ¾	1 ¾	17.1	.28
9	12:00	12:30	30	24	25 ¾	1 ¾	17.1	.28
10	12:30	1:00	30	24	25 ¾	1 ¾	17.1	.28
11	1:00	1:30	30	24	25 ¾	1 ¾	17.1	.28
12	1:31	2:01	30	24	25 ¾	1 ¾	17.1	.28
13								
14								
15								
<p>COMMENTS: Sunny clear (70° to 95°) Ground dry. First two measurements didn't meet sandy soil criteria. Pre-soaked on 7/31/25.</p>								

PERCOLATION TEST DATA SHEET – INFILTRATION TESTING

Project: South Perris FS				Project No.: S168-196		Date: 8/1/2025		
Test Hole No.: I-03				Tested By: Floyd Collins				
Depth of Test Hole (D_T): 60"				USCS Soil Classification: CL				
Test Hole Dimensions (inches)				Length		Width		
Diameter (if round)= 8"		Sides (if rectangular) =						
Sandy Soil Criteria Test*								
Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6" (Y/N)	
1	7:50	8:20	30	33 ½	37 ½	4	N	
2								
3								
<p>*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".</p>								
Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	$\Delta D = \Delta H$ Change in Water Level (in.)	Perc. Rate min./in.	I_T $\frac{\Delta H 60r}{\Delta t(r+2H)}$ Avg
1	7:50	8:20	30	33 ½	37 ½	4	7.5	
2	8:22	8:52	30	34	36	2	15	
3	8:52	9:22	30	36	38	2	15	
4	9:22	9:52	30	36	38	2	15	
5	9:53	10:23	30	36	38	2	15	
6	10:23	10:53	30	36	37 ¾	1 ¾	17.1	.28
7	10:53	11:23	30	36	37 ¾	1 ¾	17.1	.28
8	11:24	11:54	30	36	37 ¾	1 ¾	17.1	.28
9	11:54	12:24	30	36	37 ¾	1 ¾	17.1	.28
10	12:25	12:55	30	36	37 ¾	1 ¾	17.1	.28
11	12:55	1:25	30	36	37 ¾	1 ¾	17.1	.28
12	1:26	1:56	30	36	37 ¾	1 ¾	17.1	.28
13								
14								
15								
<p>COMMENTS: Sunny clear (70° to 95°) Ground dry. First two measurements didn't meet sandy soil criteria. Pre-soaked on 7/31/25.</p>								

PERCOLATION TEST DATA SHEET – INFILTRATION TESTING

Project: South Perris FS				Project No.: S168-196		Date: 8/1/2025		
Test Hole No.: I-04				Tested By: Floyd Collins				
Depth of Test Hole (D_T): 48"				USCS Soil Classification: CL				
Test Hole Dimensions (inches)				Length		Width		
Diameter (if round)= 8"		Sides (if rectangular) =						
Sandy Soil Criteria Test*								
Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6" (Y/N)	
1	7:47	8:17	30	24	28	4	N	
2								
3								
<p>*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".</p>								
Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	ΔD=ΔH Change in Water Level (in.)	Perc. Rate min./in.	I_T $\frac{\Delta H 60r}{\Delta t(r+2H)}$ Avg
1	7:47	8:17	30	24	28	4	7.5	
2	8:18	8:48	30	24	26	2	15	
3	8:49	9:19	30	24	25 ¾	1 ¾	17.1	
4	9:19	9:49	30	24	25 ¾	1 ¾	17.1	.28
5	9:50	10:20	30	24	25 ¾	1 ¾	17.1	.28
6	10:20	10:50	30	24	25 ¾	1 ¾	17.1	.28
7	10:51	11:21	30	24	25 ¾	1 ¾	17.1	.28
8	11:21	11:51	30	24	25 ¾	1 ¾	17.1	.28
9	11:52	12:22	30	24	25 ¾	1 ¾	17.1	.28
10	12:22	12:52	30	24	25 ¾	1 ¾	17.1	.28
11	12:53	1:23	30	24	25 ¾	1 ¾	17.1	.28
12	1:263	1:53	30	24	25 ¾	1 ¾	17.1	.28
13								
14								
15								
<p>COMMENTS: Sunny clear (70° to 95°) Ground dry. First two measurements didn't meet sandy soil criteria. Pre-soaked on 7/31/25.</p>								

***APPENDIX D –
Geologic Hazard Report***



GEOLOGIC HAZARDS REPORT
SOUTH PERRIS FIRE STATION CIP F077
NORTHEAST OF MURRIETA AND WATSON ROADS
CITY OF PERRIS, CALIFORNIA

Project No. 254143-1

August 6, 2025

Prepared for:

Inland Foundation Engineering, Inc.
1310 South Santa Fe Avenue
San Jacinto, CA 92583

Consulting Engineering Geology & Geophysics

P.O. Box 1090, Loma Linda, CA 92354 • 909 796-4667

Inland Foundation Engineering, Inc.
1310 South Santa Fe Avenue
San Jacinto, CA 92583

Attention: Mr. Allen Evans, P.E., G.E., Principal

Regarding: Geologic Hazards Report
South Perris Fire Station CIP F077
Northeast of Murrieta and Watson Roads
City of Perris, California
IFE Project No. S168-196

INTRODUCTION

At your request, this firm has prepared a geologic hazards report for the proposed new fire station facilities and associated appurtenances, as referenced above. The purpose of this study was to evaluate the existing geologic conditions of the property and any corresponding potential geologic and/or seismic hazards, with respect to the proposed development from a geologic standpoint. This report has been prepared utilizing the suggested "Checklist for the Review of Engineering Geology and Seismology Reports for California Public Schools, Hospitals, and Essential Services Buildings" (California Geological Survey Note 48, 2022), along with the accompanying CGS Note 48 Checklist (Sydnor, 2004).

The scope of services provided for this evaluation included the following:

- **Review of available published and unpublished geologic/seismic data in our files pertinent to the site, including the provided site-specific boring logs.**
- **Performing a seismic surface-wave survey by a licensed State of California Professional Geophysicist that included one traverse for shear-wave velocity analysis purposes.**
- **Evaluation of the local and regional tectonic setting and historical seismic activity, including performing a site-specific CBC ground motion analysis.**
- **Preparation of this report presenting our findings, conclusions, and recommendations from a geologic standpoint.**

Accompanying Maps and Appendices

- Plate 1 - Regional Geologic Map
- Plate 2 - Site Plan
- Appendix A - Shear-Wave Survey
- Appendix B - Site-Specific Ground Motion Analysis
- Appendix C - References

PROJECT SUMMARY

Based on the information that has been provided, we understand that a new fire station and associated appurtenances, will be constructed, that will be located along the east side of Murrieta Road, north of Watson Road, in the City of Perris, California. Since this report will be appended into the geotechnical report prepared for the site by Inland Foundation Engineering, Inc. (IFE), some descriptive sections such as site description, proposed development, etc., have been purposely omitted as they are described in detail in the main geotechnical report.

No grading plans were available for this evaluation, and no subsurface exploration was performed by this firm. Our scope of services included a field reconnaissance, performing a seismic shear-wave survey, and a review of available geologic and geotechnical data in our files. This review also included the provided exploratory boring logs (drilled July 31, 2025) that were prepared by IFE, which were excavated within the proposed construction area. The approximate location of the seismic shear-wave traverse (Seismic Line SW-1) is shown on a partial modified copy of the provided Site Plan (STK, Sheet A1.0, dated July 2025), which is presented on the Site Plan, Plate 2. Photographic views of the seismic shear-wave survey traverse have been included within Appendix A for visual and reference purposes.

GEOLOGIC SETTING

The subject site is situated within a natural geomorphic province in southwestern California known as the Peninsular Ranges, which is characterized by steep, elongated ranges and valleys that trend northwesterly. This province is believed to have begun as a thick accumulation of predominantly marine sedimentary and volcanic rocks during the late Paleozoic and early Mesozoic. Following this accumulation, in mid-Cretaceous time, the province underwent a pronounced episode of mountain building. The accumulated rocks were then complexly metamorphosed and intruded by igneous rocks, known locally as the Southern California Batholith. A period of erosion followed the mountain building, and during the late Cretaceous and Cenozoic time, sedimentary and subordinate volcanic rocks were deposited upon the eroded surfaces of the batholithic and pre-batholithic rocks.

More specifically, the site is situated along the northeastern portion of the Perris Block (sub-structural block of the Peninsular Ranges), that is an eroded mass of Cretaceous and older crystalline rock. The Perris Block, approximately 20 miles by 50 miles in extent, is bounded by the San Jacinto Fault Zone to the northeast, the Elsinore Fault Zone to the southwest, the Cucamonga Fault to the northwest, and to the southeast by the fringes of the Temecula basin where the boundary is ill-defined.

The Perris Block has had a complex history, apparently undergoing relative vertical land movements of several thousand feet in response to movement on the Elsinore and San

Jacinto Fault Zones. These movements of the geologic past, in conjunction with the semi-arid climate and the weathering resistance of the rock, are responsible for the formation and preservation of ancient, generally flat-lying erosion surfaces now present at various elevations that give this region its unique geologic character.

EARTH MATERIALS

Geologic mapping of the area by the Morton (2003), as illustrated on Plate 1, indicates that the subject site is mantled by late Holocene age alluvial fan deposits (symbol Qv_{sc}, see Plate 1). These materials have been generally described as being comprised of unconsolidated gravel, sand, and silt fluvial deposits. Site-specific subsurface exploratory borings excavated by IFE (2025) within the subject construction area, indicate the earth materials to consist of highly-interbedded and thinly layered silty clay, sandy clay, sandy silt, clayey sand, silty sand, and sand, that have a wide range in grain size from fine to very coarse-grained, which are in an overall medium- to very-dense/stiff to very stiff condition, to a depth of at least 51½ feet.

FAULTING

At least forty-one major "potentially active/active" (late Quaternary) faults are within a 100-kilometer (62-mile) radius of the subject site (Blake, 1989-2000a). Of these, there are no active faults known to traverse the site based on published literature. In addition, the site is not located within a State of California "Alquist-Priolo Earthquake Fault Zone" for fault rupture hazard (California Geological Survey, 2018).

The nearest known active fault is the Glen Ivy North Fault, which is a segment of the Elsinore Fault Zone and is located approximately 9.3± miles to the southwest. The Elsinore Fault zone is a major dextral strike-slip fault zone that is part of the San Andreas Fault system and is locally comprised of at least five sections, of which is locally referred to as the Glen Ivy section. This fault forms the northeast boundary of the Santa Ana Mountains, and, together with the Temecula section, forms the Elsinore trough.

The Glen Ivy North Fault is a right-lateral, strike-slip fault, being approximately 36-kilometers in length, with an estimated maximum moment magnitude (M_w) earthquake of $M_w 6.8$ and an associated slip-rate of 5.0 ± 2.0 mm/year (C.D.M.G., 1996, Cao, et al., 2003, and Petersen, 2008). Collectively, the Elsinore Fault Zone (which includes the Whittier, Glen Ivy, Temecula, Julian, and Coyote Mountain Faults segments) is a 232-kilometer long right-lateral, strike-slip fault. When considering that a cascading effect of rupture will occur along the entire length of the Elsinore Fault Zone, the total rupture area of these combined fault segments is 3,841.7 square kilometers and has an associated Maximum Moment Magnitude (M_w) of 7.8.

GROUND MOTION ANALYSIS

According to California Geological Survey Note 48 (CGS, 2022), a site-specific ground motion analysis is required for the subject site (CBC, 2022, Section 1613A and also as required by ASCE 7-16, Chapter 21), the detailed results of which are presented within Appendix B. Additionally, a seismic shear-wave survey was conducted for this study by our firm as presented within Appendix A of this report, for purposes of determining the Site Classification and V_{S30} input values for the ground motion analysis.

Geographically, the proposed construction area is centrally located at Latitude 33.75263, Longitude -117.20584 and (World Geodetic System of 1984 coordinates). The mapped spectral acceleration parameters, coefficients, and other related seismic parameters, were evaluated using the OSHPD Seismic Design Maps (OSHPD, 2025) and the California Building Code criteria (CBC, 2022), with the site-specific ground motion analysis being performed following Section 21 of the ASCE 7-16 Standard (2017). The results of this site-specific analysis have been summarized and are tabulated below:

TABLE 1 – SUMMARY OF SEISMIC DESIGN PARAMETERS

Factor or Coefficient	Value
S_s	1.422g
S_1	0.526g
F_a	1.0
F_v	1.774
S_{DS}	0.990g
S_{D1}	0.700g
S_{MS}	1.480g
S_{M1}	1.052g
T_L	8 Seconds
MCE_G PGA	0.64g
Shear-Wave Velocity (V_{100})	1,126.9 ft/sec
Site Classification	D
Risk Category	III

GROUNDWATER

The subject site is located within the southwestern-most portion of the San Jacinto groundwater basin and more specifically, within the Meniffee subbasin. The basin deposits consist of cemented sands at depth and partly cemented sands nearer to the land surface and extends to a depth of at least 445 feet (Rees, 1995). The boundary of this subbasin is generally formed by the surrounding outcrops of the underlying crystalline rocks.

Groundwater data provided by the California Department of Water Resources (2025b), indicates that the closest measures water well is located approximately 1,500± feet to the southeast (State Well No. 05S03W09E001S). The water-level data indicates that during the time period of 1995 to 2025, groundwater varied between 50 to 85± feet in depth. Another nearby well, located 2,500± feet to the southeast (Local Well Name EMWD14355) indicates that during 2011 to 2025, groundwater varied between 49 to 56± feet in depth. Based on subsurface exploratory data provided by IFE (2025), groundwater was encountered at a depth of 41± feet. The exploratory borings logs indicate that mottled soils were encountered as shallow as 35± feet in depth, which most likely represents the historic high-groundwater level.

HISTORIC SEISMICITY

A computerized search, based on Southern California historical earthquake catalogs, has been performed using the ANSS Comprehensive Earthquake Catalog (U.S.G.S., 2025a). The following table and discussion summarizes the historic seismic events (greater than or equal to M4.0) that have been estimated and/or recorded during the time period of 1800 to July 2025, within a 100-kilometer radius of the site.

TABLE 2 - HISTORIC SEISMIC EVENTS; 1800-2025 (100-kilometer radius)

<u>Richter Magnitude (M)</u>	<u>No. of Events</u>
4.0 - 4.9	489
5.0 - 5.9	60
6.0 - 6.9	15
7.0 - 7.9	2
8.0+	0

An Earthquake Epicenter Map which includes magnitudes 4.0 and greater for a 100-kilometer (62-mile) radius from the subject site, has been included below as Figure 1, for reference. This map was prepared using the ANSS Comprehensive Earthquake Catalog (U.S.G.S., 2025a) of instrumentally recorded events from the period of 1932 to July 2025, in turn overlain on Google™ Earth imagery (2025).

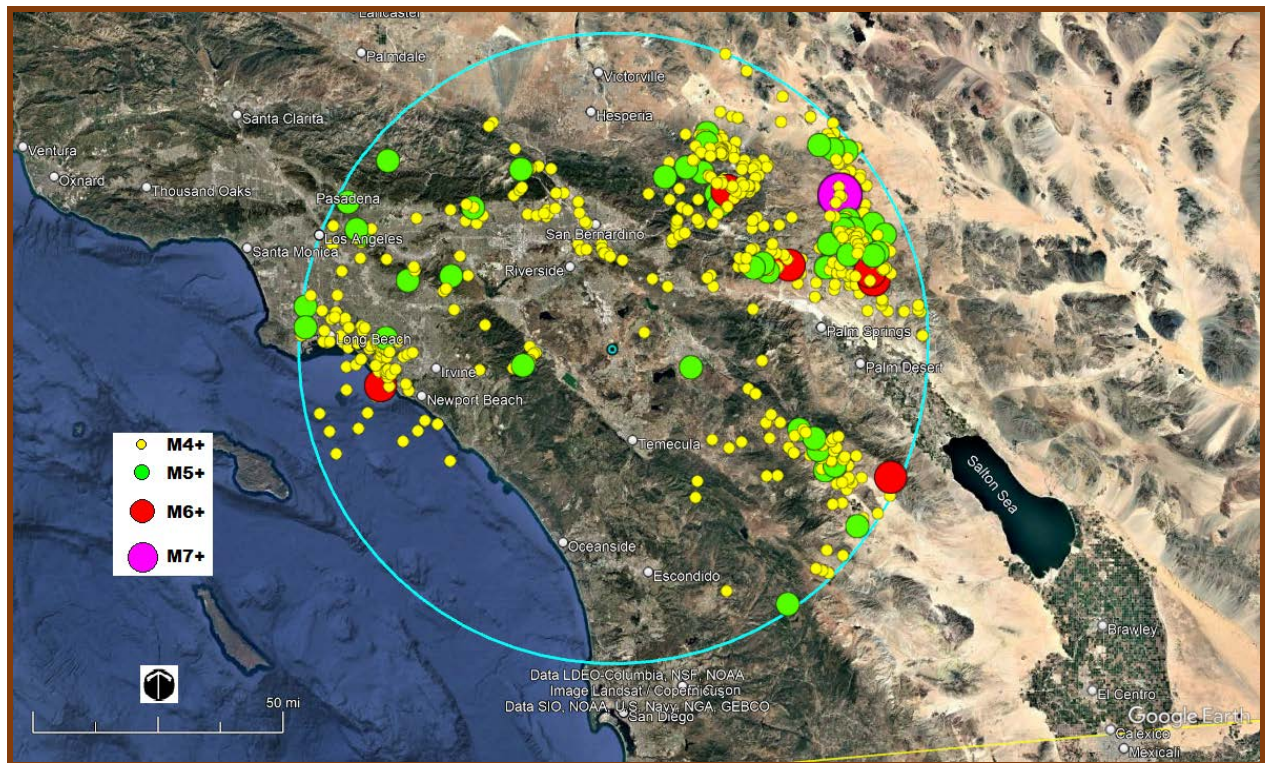


FIGURE 1- Earthquake Epicenter Map showing events of M4.0+ within a 100-kilometer radius.

It should be noted that pre-instrumental seismic events (generally before 1932) have been estimated from isoseismal maps (Toppozada, et al., 1981 and 1982). These data have been compiled generally based on the reported intensities throughout the region, thus focusing in on the most likely epicentral location. Instrumentation beyond 1932 has greatly increased the accuracy of locating earthquake epicenters. A summary of the historic earthquake data is as follows:

- ❑ The largest estimated historical earthquake magnitude (pre-1932) within a 62-mile radius is the M7.5 event of December 8, 1812 (approximately 49 miles northwest).
- ❑ The largest recorded historical earthquake was the M7.6 (M_w 7.3) Landers event, located approximately 54 miles to the northeast (June 28, 1992).
- ❑ The nearest estimated significant earthquake epicenter (pre-1932) was located approximately 13 miles east, being a M6.8 event (April 21, 1918).
- ❑ The nearest recorded significant historic earthquake epicenter was approximately 15½ miles southeast of the site (September 23, 1963, M5.3).
- ❑ The largest estimated ground acceleration estimated to have been experienced at the site was 0.255g, which resulted from the M6.8 earthquake of April 21, 1918, as noted above, based on the attenuation relationship of Boore et al. (1997).

FLOODING

According to the Federal Emergency Management Agency (FEMA), the subject site is shown to be located within the boundaries of a 100-year flood (Community Panel No. 06065C 1440H, August 18, 2014). More specifically, the site is shown to be located within "Zone AE", which is defined as "The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights". Additionally, based on the City of Perris General Plan (2021), the site is shown to be located within the limits of a "Floodway", within the mapped 100-Year Flood (Figure S-3 - FEMA Flood Hazards Zone).



FIGURE 2- Flood Insurance Rate Map (FEMA, 2014), Site outlined in red.

SECONDARY SEISMIC HAZARDS

Secondary permanent or transient seismic hazards that are generally associated with severe ground shaking during an earthquake include ground rupture, liquefaction, seiches or tsunamis, flooding (water storage facility failure), ground lurching/lateral spreading, landsliding, rockfalls, and seismically-induced settlement. These hazards are discussed below.

Ground Rupture:

Ground rupture is generally considered most likely to occur along pre-existing faults. Since there are no faults that are known to traverse the site, the potential for ground rupture is considered to be nil.

Landsliding:

Due to the low-lying relief of the site and adjacent areas, landsliding due to seismic shaking is considered nil. Additionally, based on the City of Perris General Plan (2021), the site is not located within a zone of potential landsliding (Figure S-7, Landslide Susceptibility).

Seiches/Tsunamis:

Based on the far distance of large, open bodies of water and the elevation of the site with respect to sea level, the possibility of seiches/tsunamis is considered nil. Additionally, mapping by the California Geological Survey (2014) does not indicate the site to be located within a tsunami inundation zone.

Liquefaction:

In general, liquefaction is a phenomenon that occurs where there is a loss of strength or stiffness in the soils that can result in the settlement of buildings, ground failures, or other hazards. The main factors contributing to this phenomenon are: 1) cohesionless, granular soils having relatively low densities (usually of Holocene age); 2) shallow ground water (generally less than 50 feet); and 3) moderate-high seismic ground shaking. The City of Perris General Plan (2021) indicates the site to be located within a zone of moderate liquefaction susceptibility (Figure S-6; Earthquake Faults and Liquefaction Susceptibility). Additionally, groundwater was encountered by IFE during the on-site subsurface exploration at a depth of 41± feet. It was also noted that mottled soils were present as shallow as 35± feet, most likely indicating historic high-groundwater levels. Based on the shallow groundwater conditions and the presence of unconsolidated fine-grained alluvial sediments, the potential for liquefaction to occur appears to be possible.

Flooding (Water Storage Facility Failure)-

According to the California Department of Water Resources (2025a) "California Dam Inundation Maps", the subject site is shown to be located within a flood inundation zone, originating from a full dam breach failure (storm-induced) of the Lake Hemet Dam, which is located approximately 29½± miles to the east-southeast. The location of the site with respect to the flood limits is shown on the Dam Inundation Map, Figure 3 below. This area is indicated to have a Floodwave Maximum Elevation of 1429± feet, which is around 13± feet above the current site elevation (approximately 1,416± feet). This figure is a partial modified copy of Sheet 7 of 7 of the Lake Hemet Dam Inundation Map.



FIGURE 3- Dam Inundation Map (C.D.W.R., 2025a); Site outlined in green.

In addition, The City of Perris General Plan (2021) indicates the site to be located within a Dam Inundation Zone associated with the Perris Dam, located approximately $6\frac{1}{2}\pm$ miles to the north (Figure S-4; Dam Inundation Zones). According to the United States Army Corp of Engineers (2025), in the event of a catastrophic failure (Sunny Day Breach) of the main Perris Dam, the site can be expected to be covered by 6-15 feet of water, as illustrated below in Figure 4.



FIGURE 4- Dam Inundation Map (U.S.A.C.E., 2025); Site outlined in red.

Rockfalls:

Since no large rock outcrops are present at or adjacent to the site, the possibility of rockfalls during seismic shaking is nil

Seismically-Induced Settlement:

Seismically-induced settlement generally occurs within areas of loose granular soils. Since the subject site is underlain by generally medium-dense to very-dense and/or stiff to very stiff alluvial deposits, the potential for settlement is considered to be low.

Ground Lurching/Lateral Spreading-

Ground lurching is the horizontal movement of soil, sediments, or fill located on relatively steep embankments or scarps as a result of seismic activity, forming irregular ground surface cracks. The potential for lateral spreading or lurching is highest in areas underlain by soft, saturated materials, especially where bordered by steep banks or adjacent hard ground. Due to the relatively flat-lying nature of the site, distance from embankments, and dense underlying sediments, the potential for ground lurching and/or lateral spreading is nil.

OTHER GEOLOGIC HAZARDS

There are other potential geologic hazards not necessarily associated with seismic activity that occur statewide. These hazards include, but are not limited too; natural hazardous materials (such as methane gas, hydrogen-sulfide gas, and tar seeps); Radon-222 gas (EPA, 1993 and CGS, 2022b); naturally occurring asbestos; volcanic hazards (Martin, 1982); and regional subsidence. Of these hazards, there are none that appear to impact the site.

CONCLUSIONS AND RECOMMENDATIONS**General:**

Based on our review of available pertinent published and unpublished geologic/seismic literature, construction of the proposed fire station appears to be feasible from a geologic standpoint, providing our recommendations are considered during planning and construction.

Conclusions:

1. Based on available published geologic data, the subject site is shown to be underlain by late Holocene age fluvial deposits, generally described as being comprised of unconsolidated gravel, sand, and silt. Subsurface exploratory borings performed by IFE indicate the earth materials to consist of highly-

interbedded and thinly layered silty clay, sandy clay, sandy silt, clayey sand, silty sand, and sand, that have a wide range in grain size from fine to very coarse-grained, which are in an overall medium- to very-dense/stiff to very stiff condition, to a depth of at least 51½ feet.

2. Groundwater was encountered within the exploratory excavations at a depth of at 41± feet. Additionally, mottled soils were noted to be present as shallow as 35± feet, indicating possible historic high-ground water levels. Based on available published water-level data, measured groundwater levels indicate that groundwater has been as shallow locally as 49-50± feet in depth. No shallow groundwater conditions are anticipated to be encountered during construction.
3. No active faults are known to traverse the subject site, based on published literature. In addition, the existing site is not located within a designated Alquist-Priolo Earthquake Fault Zone for fault rupture hazards. The nearest "known" active fault is the Glen Ivy North Fault (one of the five segments of the greater Elsinore Fault Zone) which is located approximately 9.3± miles to the southwest. This fault has an associated maximum moment magnitude (M_w) earthquake of M_w 6.8, but when considering a cascading effect along all segments of the Elsinore Fault Zone, a maximum moment magnitude (M_w) earthquake of M_w 7.8 is considered possible.
4. The primary geologic hazard that exists at the site is that of ground shaking, which accounts for nearly all earthquake losses. Moderate to severe ground shaking could be anticipated during the life of the proposed facilities.
5. Based on our study and review of available published literature, there appears to a potential for flooding to occur (dam inundation) in the event of catastrophic failure of the Perris Dam, located approximately 6½± miles to the northeast. Additionally, the site is also located within flood inundation limits associated with Lake Hemet Dam, located approximately 29½± miles to the east-southeast. No other permanent and/or transient secondary seismic hazards are expected to occur within the proposed construction area.
6. The subject site is also located within a floodway path associated with a 100-year flood.

Recommendations:

1. The potential for flooding occurring as a result of dam inundation resulting from the catastrophic failure of both Perris and Lake Hemet Dams, in addition to a 100-year flood, should be properly evaluated by the project Civil Engineer. Appropriate site-specific mitigation measures, with respect to flooding potentials, should be implemented as recommended, if warranted.

2. It is recommended that all structures be designed to at least meet the current California Building Code provisions in the latest 2022 CBC edition and the 2016 ASCE Standard 7-16, where applicable. However, it should be noted that the building code is intended as a minimum construction design and is often the maximum level to which structures are designed. Structures that are built to minimum code are designed to at least remain operational after an earthquake. It is the responsibility of both the property owner and project structural engineer to determine the risk factors with respect to using CBC minimum design values for the proposed facilities.
3. For seismic design purposes, it is recommended that the design earthquake magnitudes, with respect to multi-segment rupture potentials, be taken into account when considering that a cascading effect of rupture will occur along the entire length of the Elsinore Fault Zone. Such an event should use a design earthquake magnitude of M_w 7.8.

CLOSURE

Our conclusions and recommendations are based on a review of available existing geologic/seismic data and the provided site-specific subsurface exploratory boring logs. No subsurface exploration was performed by this firm for this evaluation. We make no warranty, either express or implied. Should conditions be encountered at a later date or more information becomes available that appear to be different than those indicated in this report, we reserve the right to reevaluate our conclusions and recommendations and provide appropriate mitigation measures, if warranted. It is assumed that all the conclusions and recommendations outlined in this report are understood and followed. If any portion of this report is not understood, it is the responsibility of the owner, contractor, engineer, and/or governmental agency, etc., to contact this office for further clarification.

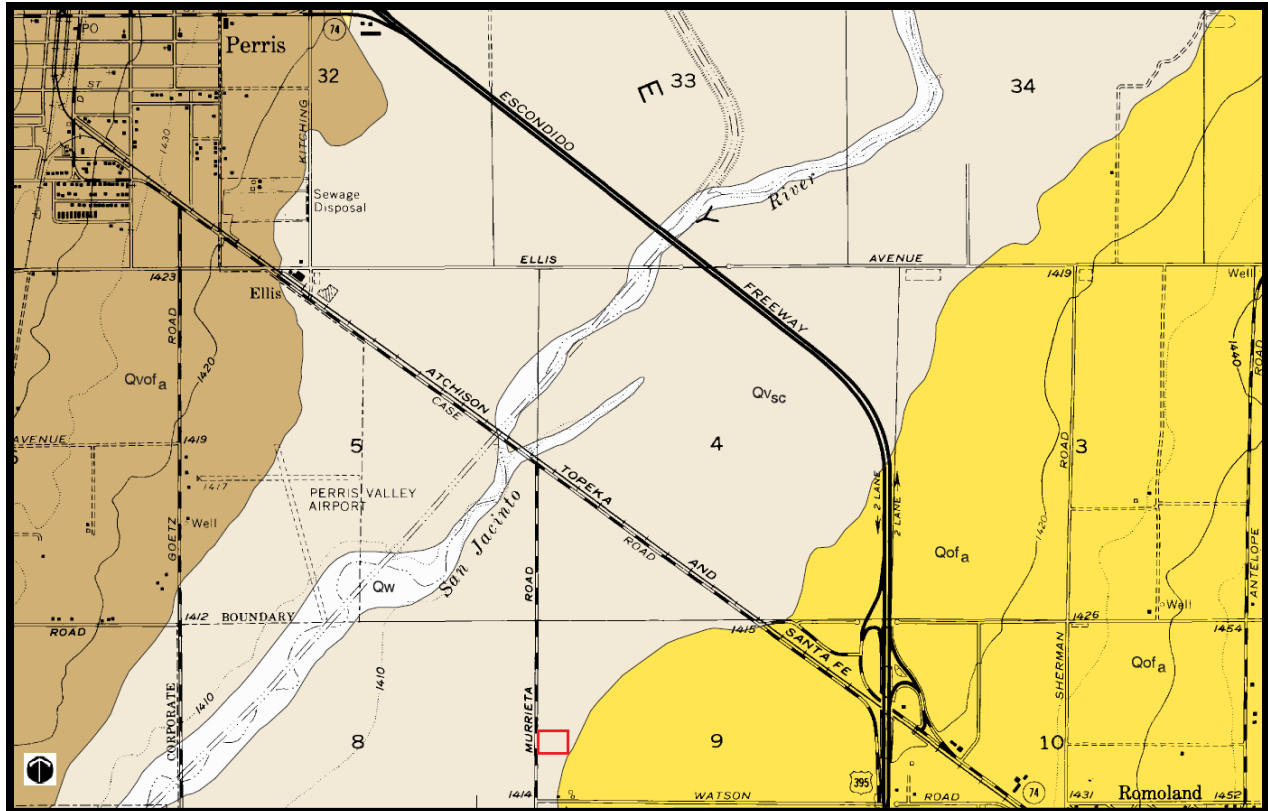
Respectfully submitted,
TERRA GEOSCIENCES



Donn C. Schwartzkopf
Principal Geologist / Geophysicist
CEG 1459 / PGP 1002


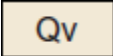

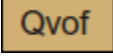



REGIONAL GEOLOGIC MAP

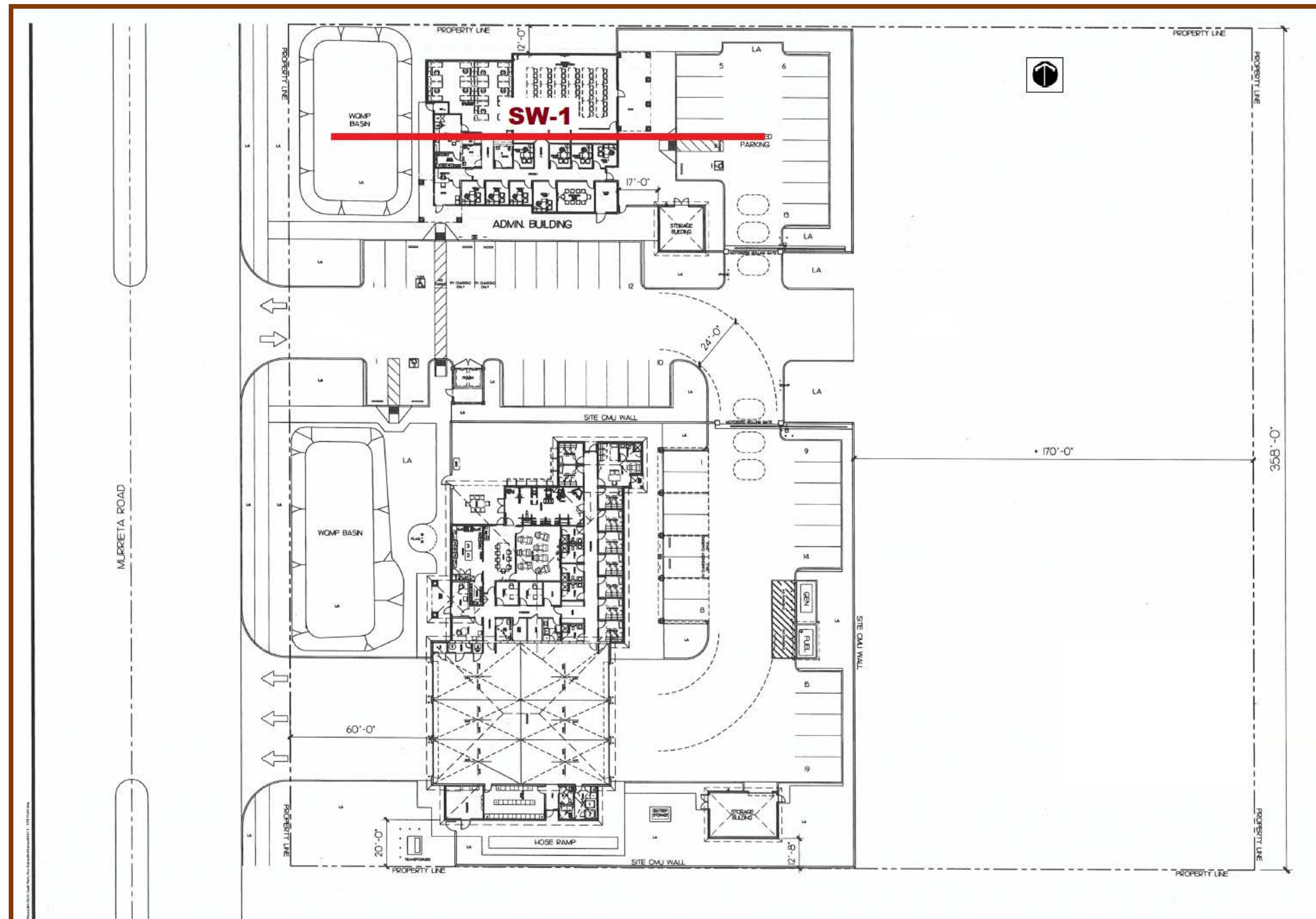


BASE MAP: Morton (2003), U.S.G.S. Open-File Report 03-270, Scale 1: 24,000; Site outlined in red.

PARTIAL LEGEND

	WASH DEPOSITS	Unconsolidated sand and gravel in ephemeral river channel (Late Holocene).
	VALLEY DEPOSITS	Unconsolidated gravel, sand, and silt fluvial deposits (Late Holocene).
	OLDER ALLUVIUM	Indurated reddish-brown sandy alluvial fan deposits (late to middle Pleistocene).
	OLDER FAN DEPOSITS	Well dissected and indurated reddish-brown sand deposits (early Pleistocene).
	GEOLOGIC CONTACT	Solid where located within 15±-meters, dashed where located within 30±-meters.

SITE PLAN



BASE MAP: Partial modified copy of the provided "Site Plan", prepared by STK (Sheet A1.0; dated July 2025); Shear-wave traverse **SW-1** shown as red line.

APPENDIX A

SHEAR-WAVE SURVEY



SHEAR-WAVE SURVEY

Methodology

The fundamental premise of this survey uses the fact that the Earth is always in motion at various seismic frequencies. These relatively constant vibrations of the Earth's surface are called microtremors, which are very small with respect to amplitude and are generally referred to as background "noise" that contain abundant surface waves. These microtremors are caused by both human activity (i.e., cultural noise, traffic, factories, etc.) and natural phenomenon (i.e., wind, wave motion, rain, atmospheric pressure, etc.) which have now become regarded as useful signal information. Although these signals are generally very weak, the recording, amplification, and processing of these surface waves has greatly improved by the use of technologically improved seismic recording instrumentation and recently developed computer software. For this application, we are mainly concerned with the Rayleigh wave portion of the seismic signals, which is also referred to as "ground roll" since the Rayleigh wave is the dominant component of ground roll.

For the purposes of this study, there are two ways that the surface waves were recorded, one being "active" and the other being "passive." Active means that seismic energy is intentionally generated at a specific location relative to the survey spread and recording begins when the source energy is imparted into the ground (i.e., MASW survey technique). Passive surveying, also called "microtremor surveying," is where the seismograph records ambient background vibrations (i.e., MAM survey technique), with the ideal vibration sources being at a constant level. Longer wavelength surface waves (longer-period and lower-frequency) travel deeper and thus contain more information about deeper velocity structure and are generally obtained with passive survey information. Shorter wavelength (shorter-period and higher-frequency) surface waves travel shallower and thus contain more information about shallower velocity structure and are generally collected with the use of active sources.

For the most part, higher frequency active source surface waves will resolve the shallower velocity structure and lower frequency passive source surface waves will better resolve the deeper velocity structure. Therefore, the combination of both of these surveying techniques provides a more accurate depiction of the subsurface velocity structure.

The assemblage of the data that is gathered from these surface wave surveys results in development of a dispersion curve. Dispersion, or the change in phase velocity of the seismic waves with frequency, is the fundamental property utilized in the analysis of surface wave methods. The fundamental assumption of these survey methods is that the signal wavefront is planar, stable, and isotropic (coming from all directions) making it independent of source locations and for analytical purposes uses the spatial autocorrelation method (SPAC). The SPAC method is based on theories that are able to detect "signals" from background "noise" (Okada, 2003). The shear wave velocity (V_s) can then be calculated by mathematical inversion of the dispersive phase velocity of the surface waves which can be significant in the presence of velocity layering, which is common in the near-surface environment.

Field Procedures

One shear-wave survey traverse (SW-1) was performed in the northern portion of the subject site, as approximated on Plate 2. For data collection, the field survey employed a twenty-four channel Geometrics Geode model signal-enhancement refraction seismograph. This survey employed both active source (MASW) and passive (MAM) methods to ensure that both quality shallow and deeper shear-wave velocity information was recorded (Park et al., 2005).

Both the MASW and MAM survey lines used the same linear geometry array that consisted of a 184-foot-long spread using a series of twenty-four 4.5-Hz geophones that were spaced at regular eight-foot intervals. For the active source MASW survey, the ground vibrations were recorded using a one second record length at a sampling rate of 0.5-milliseconds. Two separate seismic records were obtained using a 30-foot shot offset at both ends of the line utilizing a 16-pound sledge-hammer as the energy source to produce the seismic waves. Numerous seismic impacts were used at each shot location to improve the signal-to-noise ratio.

The MAM survey did not require the introduction of any artificial seismic sources with only background ambient noise (i.e., air and vehicle traffic, etc.) being necessary. These ambient ground vibrations were recorded using a thirty-two second record length at a two-millisecond sampling rate with 20 separate seismic records being obtained for quality control purposes. The frequency spectrum data that was displayed on the seismograph screen were used to assess the recorded seismic wave data for quality control purposes in the field. The acceptable records were digitally recorded on the in-board seismograph computer and subsequently transferred to a flash drive so that they could be subsequently transferred to our office computer for analysis.

Data Reduction

For analysis and presentation of the shear-wave profile and supportive illustration, this study used the **SeisImager/SW™** computer software program that was developed by Geometrics, Inc. (2021). Both the active (MASW) and passive (MAM) survey results were combined for this analysis (Park et al., 2005). The combined results maximize the resolution and overall depth range in order to obtain one high resolution V_s curve over the entire sampled depth range. These methods economically and efficiently estimate one-dimensional subsurface shear-wave velocities using data collected from standard primary-wave (P-wave) refraction surveys.

However, it should be noted that surface waves by their physical nature cannot resolve relatively abrupt or small-scale velocity anomalies and this model should be considered as an approximation. Processing of the data then proceeded by calculating the dispersion curve from the input data from both the active and passive data records, which were subsequently combined creating an initial shear-wave (V_s) model based on the observed data. This initial model was then inverted in order to converge on the best fit of the initial model and the observed data, creating the final V_s curve as presented within this appendix.

Summary of Data Analysis

Data acquisition went very smoothly and the quality was considered to be good. Analysis revealed that the average shear-wave velocity (“weighted average”) in the upper 100 feet of the subject survey area is **1,126.9** feet per second as shown on the shear-wave model for Seismic Line SW-1, as presented within this appendix. This average velocity classifies the underlying soils to that of a Site Class “**D**” (“Stiff Soil” profile), which has a seismic velocity range from 600 to 1,200 ft/sec (ASCE, 2017; Table 20.3-1).

The “weighted average” velocity is computed from a formula that is used by the ASCE (2017; Section 20.4, Equation 20.4-1) to determine the average shear-wave velocity for the upper 100 feet of the subsurface (V_{100}).

$$V_s = 100 / [(d_1/v_1) + (d_2/v_2) + \dots + (d_n/v_n)]$$

Where $d_1, d_2, d_3, \dots, d_n$, are the thicknesses for layers 1, 2, 3, ..., n , up to 100 feet, and $v_1, v_2, v_3, \dots, v_n$, are the seismic velocities (feet/second) for layers 1, 2, 3, ..., n . The detailed shear-wave model displays these calculated layer boundaries/depths and associated velocities (feet/second) for the 228-foot profile where locally measured. The constrained data limits are represented by the dark-gray shading on the shear-wave model. The associated Dispersion Curves (for both the active and passive methods) which show the data quality and picks, along with the resultant combined dispersion curve model, are also included within this appendix, for reference purposes.

SURVEY LINE PHOTOGRAPHS



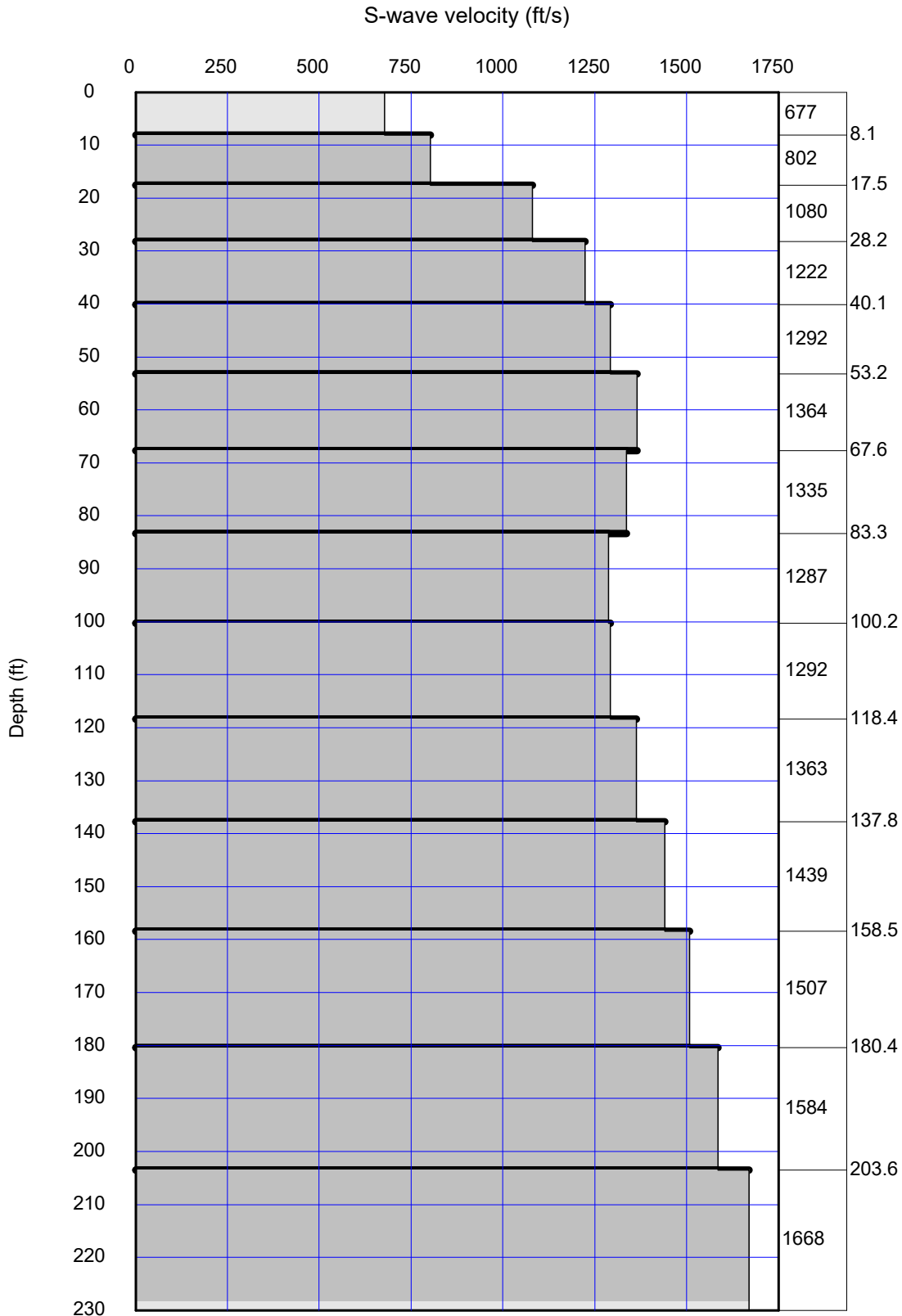
View looking west along Seismic Line SW-1.



View looking east along Seismic Line SW-1.

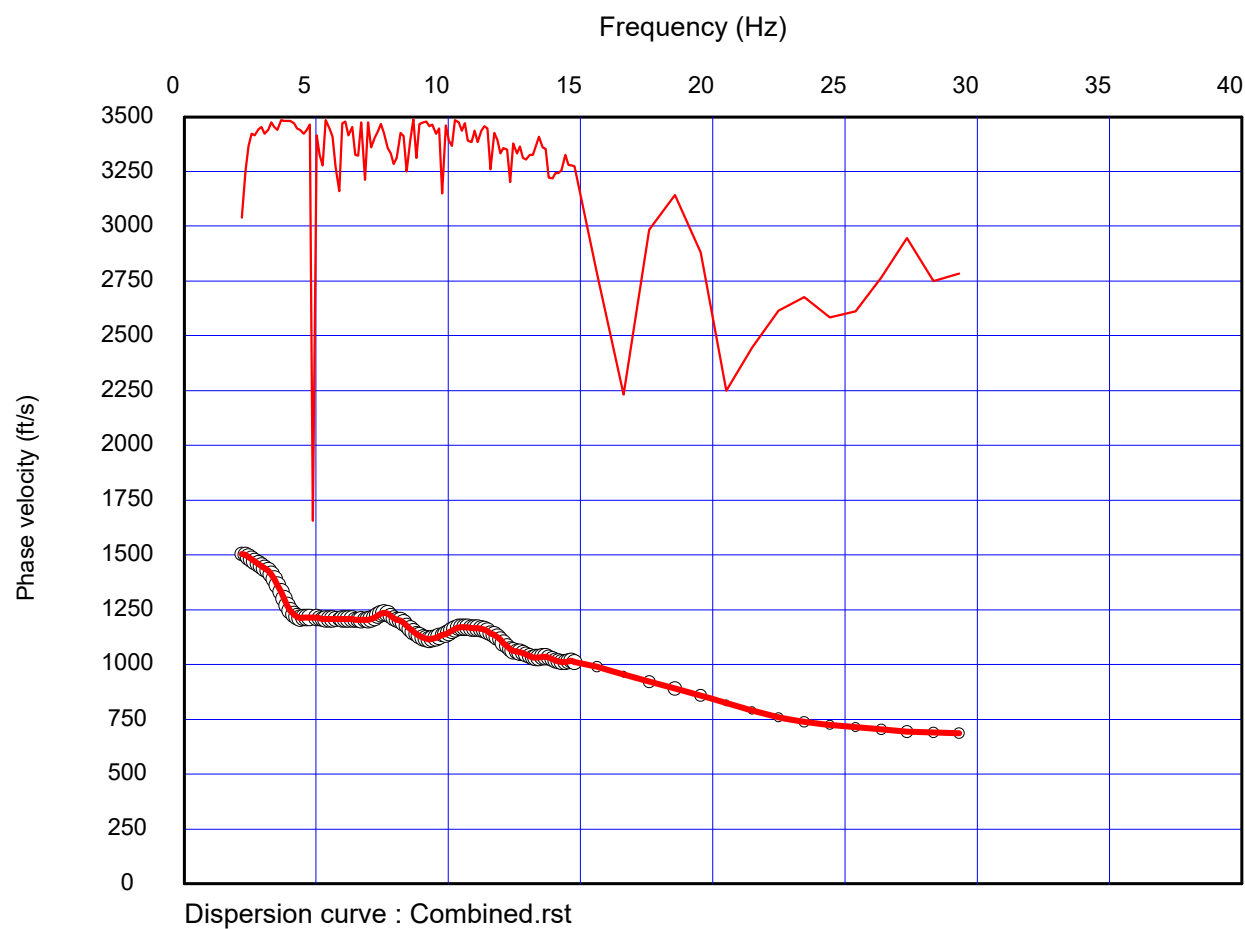
SEISMIC LINE SW-1

SHEAR-WAVE MODEL



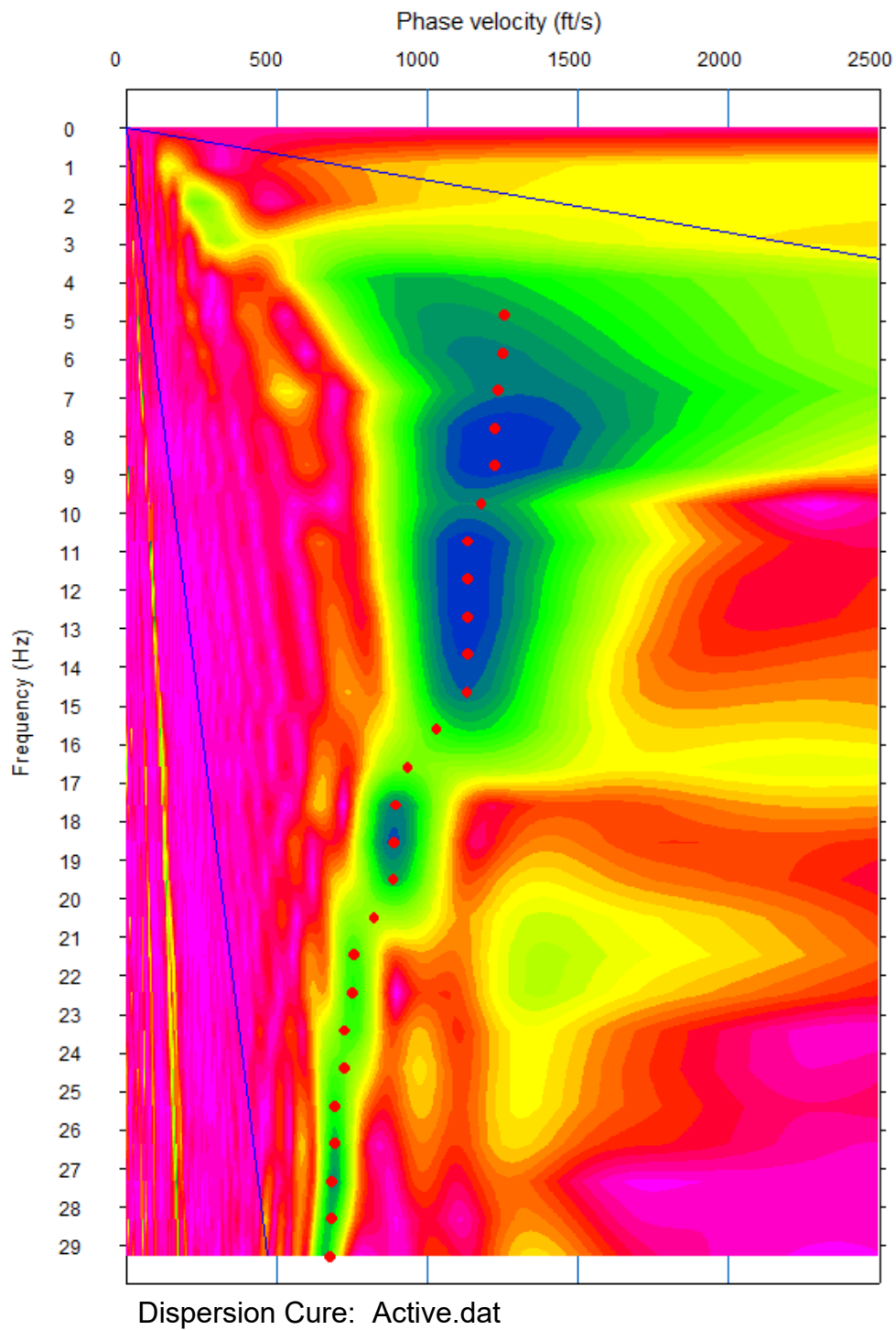
S-wave velocity model (initial): Final.rst **Average Vs 100ft = 1126.9 ft/sec**

SEISMIC LINE SW-1



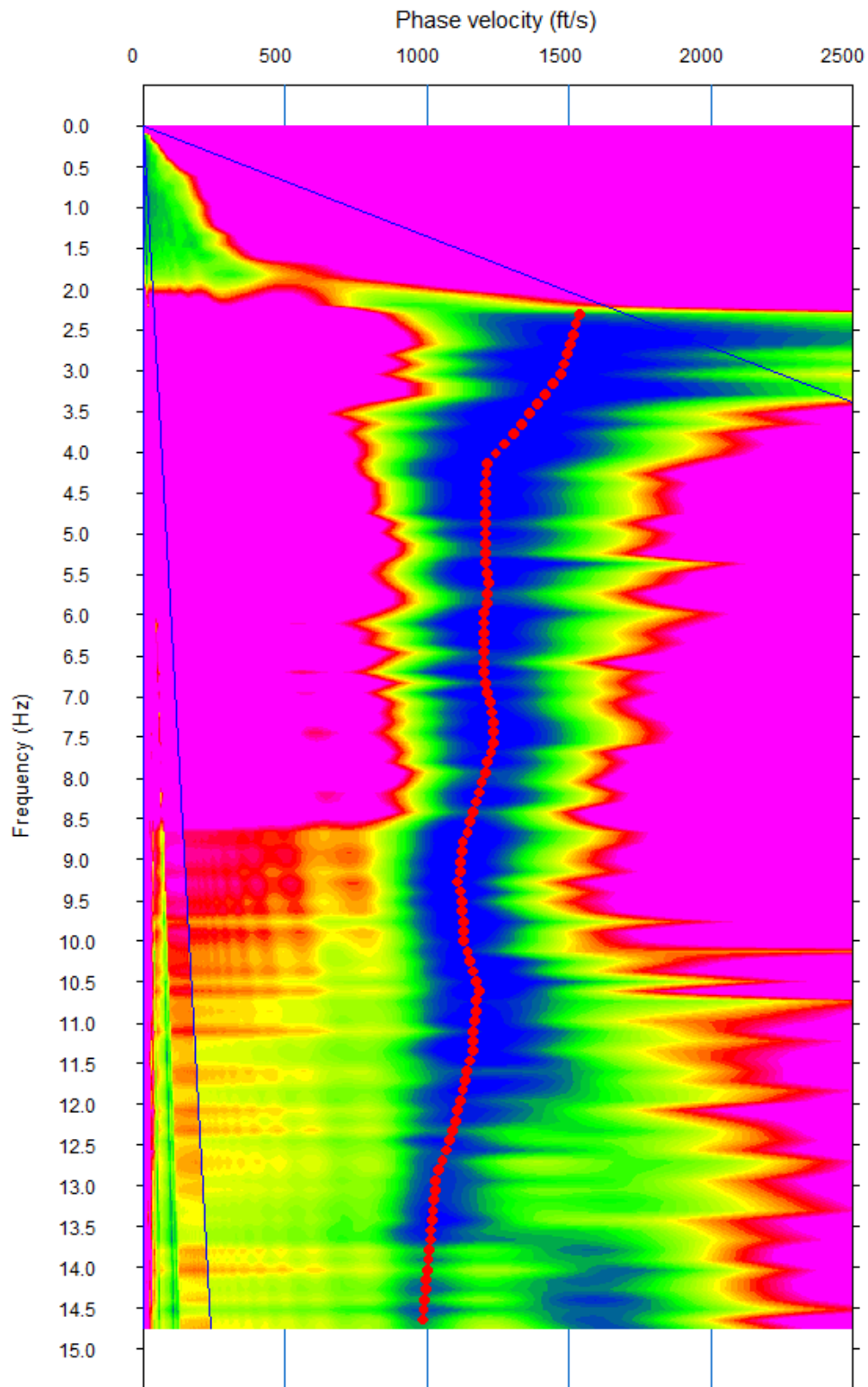
COMBINED DISPERSION CURVE

SEISMIC LINE SW-1



ACTIVE DISPERSION CURVE

SEISMIC LINE SW-1



Dispersion Curve: Passive.dat

PASSIVE DISPERSION CURVE

APPENDIX B

SITE-SPECIFIC GROUND MOTION ANALYSIS



SITE-SPECIFIC GROUND MOTION ANALYSIS

A detailed summary of the site-specific ground motion analysis, which follows Section 21 of the ASCE Standard 7-16 (2017) and the 2022 California Building Code is presented below, with the Seismic Design Parameters Summary included within this appendix following the summary text.

◆ Mapped Spectral Acceleration Parameters (CBC 1613A.2.1)-

Based on maps prepared by the U.S.G.S (Risk-Adjusted Maximum Considered Earthquake (MCE_R) Ground Motion Parameter for the Conterminous United States for the 0.2 and 1-second Spectral Response Acceleration (5% of Critical Damping; Site Class B/C), a value of **1.422g** for the 0.2 second period (S_s) and **0.526g** for the 1.0 second period (S_1) was calculated (ASCE 7-16 Figures 22-1, 22-2 and CBC 1613A.2.1).

◆ Site Classification (CBC 1613A.2.2 & ASCE 7-16 Chapter 20)-

Based on the site-specific measured shear-wave value of 1,126.9 feet/second (343.5 m/sec), the soil profile type used should be Site Class “D.” This Class is defined as having the upper 100 feet (30 meters) of the subsurface being underlain by “Stiff Soil” with average shear-wave velocities of 600 to 1,200 feet/second (180 to 360 meters/second), as detailed within Appendix A.

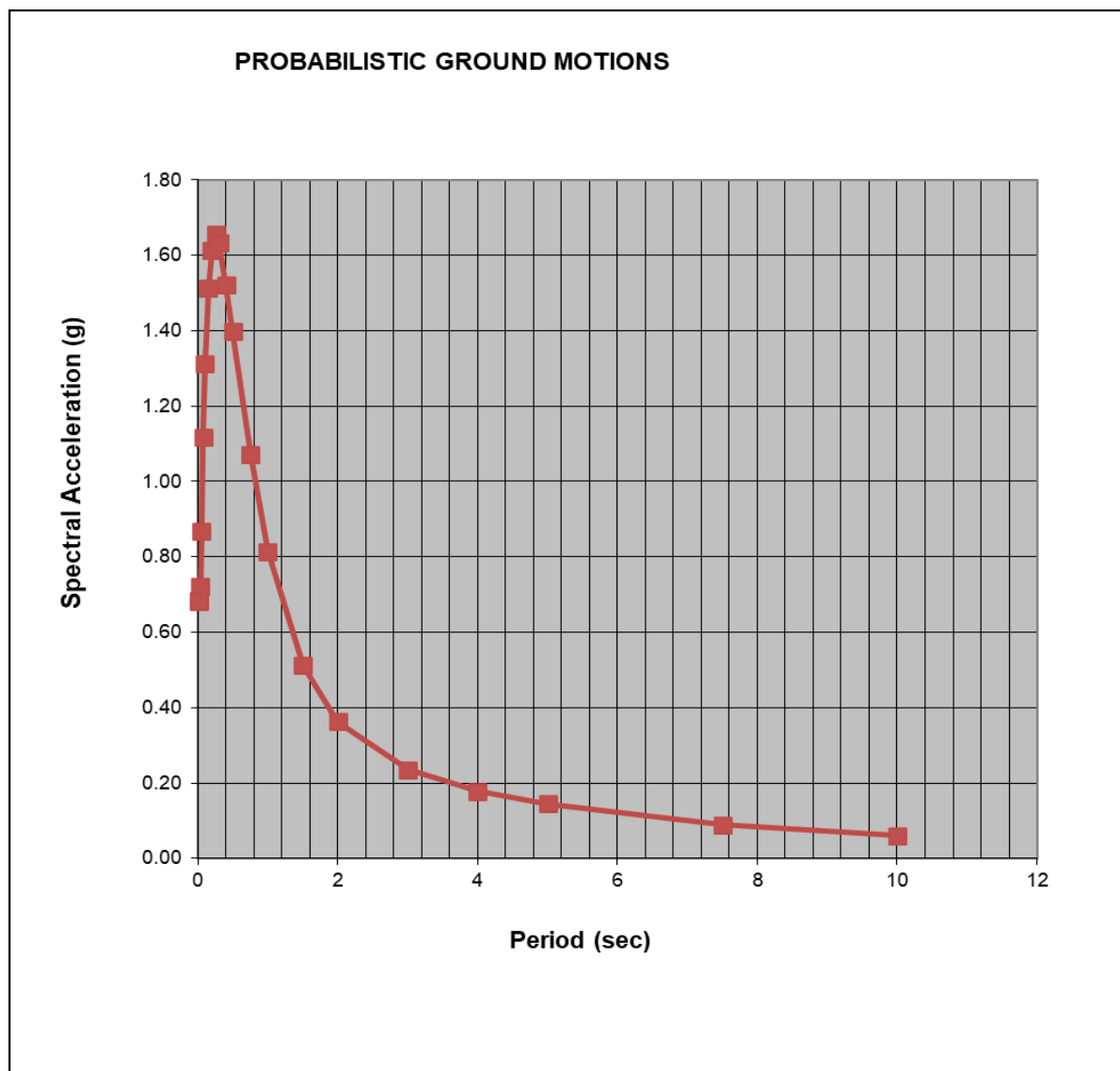
◆ Site Coefficients (CBC 1613A.2.3)-

Based on CBC Tables 1613A.2.3(1) and 1613A.2.3(2), the site coefficient $F_a = 1.0$ and $F_v = 1.774$, respectively.

◆ Probabilistic (MCE_R) Ground Motions (ASCE 7 Section 21.2.1)-

Per Section 21.2.1.1 (**Method 1**), the probabilistic MCE spectral accelerations shall be taken as the spectral response accelerations in the direction of maximum response represented by a five percent damped acceleration response spectrum that is expected to achieve a one percent probability of collapse within a 50-year period.

The probabilistic analysis included the use of the Open Seismic Hazard Analysis (OpenSHA). The selected Earthquake Rupture Forecast (ERF) was UCERF3 along with a Probability of Exceedance of 2% in 50 Years. The average of four Next Generation Attenuation West-2 Relations (2014 NGA) were utilized to produce a response spectrum. These included Chiou & Youngs (2014), Abrahamsom et al. (2014), Campbell & Bozorgnia (2014), Boore et al. (2014), and Campbell & Bozorgnia (2014). The Probabilistic Risk Targeted Response Spectrum was determined as the product of the ordinates of the probabilistic response spectrum and the applicable risk coefficient (C_R). These values were then modified to produce a spectrum based upon the maximum rotated components of ground motion. The resulting MCE_R Response Spectrum is indicated below:



◆ **Deterministic Spectral Response Analyses (ASCE 7 Section 21.2.2)-**

The deterministic MCE_R response acceleration at each period shall be calculated as an 84th-percentile 5 percent damped spectral response acceleration in the direction of maximum horizontal response computed at that period. The largest such acceleration calculated for the characteristic earthquakes on all known active faults within the region shall be used. Analyses were conducted using the average of four Next Generation Attenuation West-2 Relations (2014 NGA), including Chiou & Youngs (2014), Abrahamsom et al. (2014), Boore et al. (2014), and Campbell & Bozorgnia (2014).

Based on our review of the Fault Section Database within the Uniform California Earthquake Rupture Forecast (UCERF 3; Field et al., 2013), published geologic data, and based on the length of the combined individual segments of the Elsinore Fault Zone (controlling Fault), which is located approximately 9.3 miles to the southwest. The moment magnitude (M_W) used for this fault was 7.8 (using combined segments).

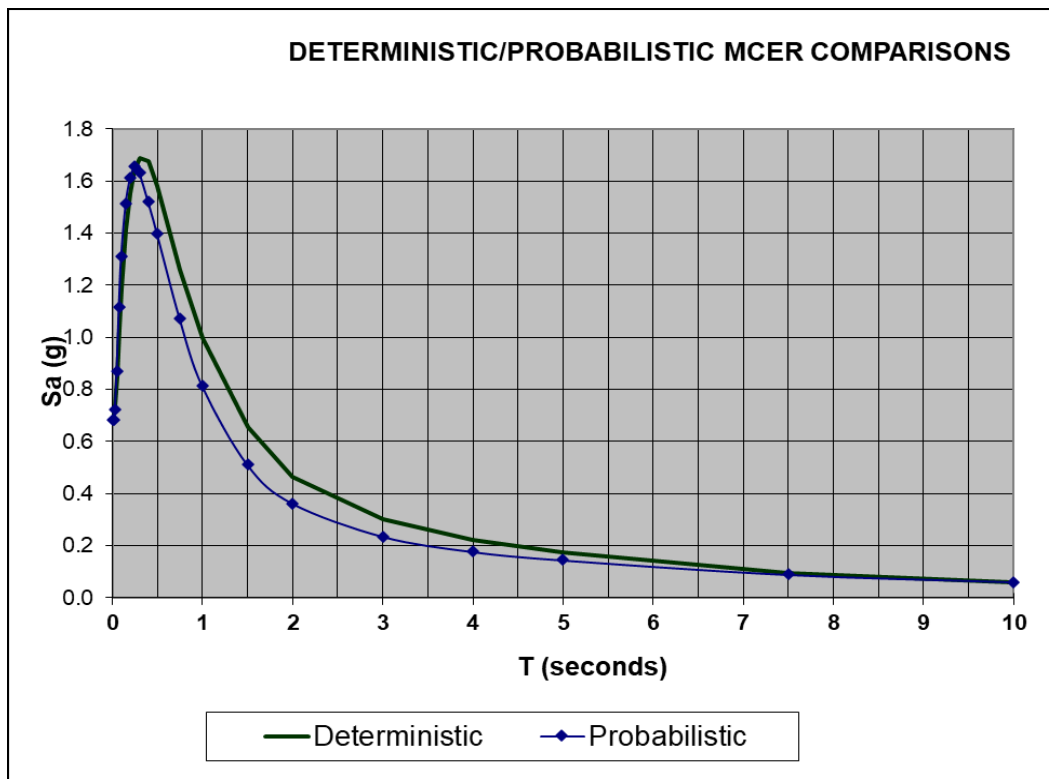
◆ **Site Specific MCE_R (ASCE 7 Section 21.2.3)-**

The site-specific MCE_R spectral response acceleration at any period, S_{aM} , shall be taken as the lesser of the spectral response accelerations from the probabilistic ground motions of Section 21.2.1 and the deterministic ground motions of Section 21.2.2. The deterministic ground motions were compared with the probabilistic ground motions that were determined in accordance with Section 21.2.1. These results are tabulated below:

Comparison of Deterministic MCE_R Values with Probabilistic MCE_R Values - Section 21.2.3

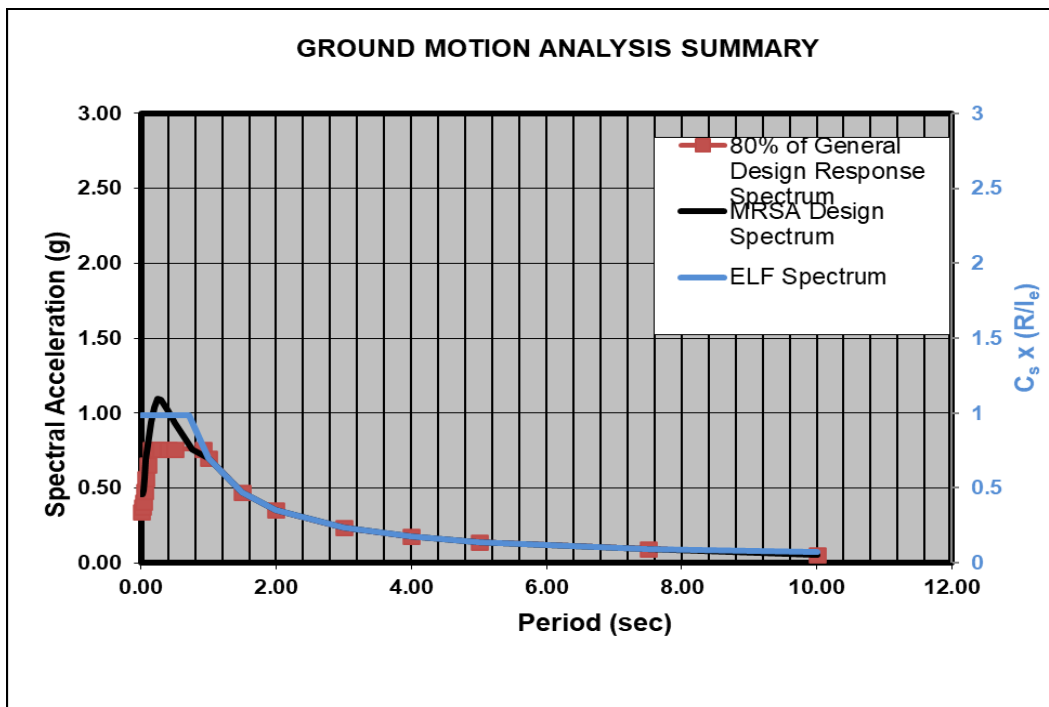
Period	Deterministic	Probabilistic	Lower Value (Site Specific MCE_R)	Governing Method
T	MCE_R	MCE_R		
0.010	0.71	0.68	0.68	Probabilistic Governs
0.020	0.71	0.68	0.68	Probabilistic Governs
0.030	0.74	0.72	0.72	Probabilistic Governs
0.050	0.85	0.87	0.85	Deterministic Governs
0.075	1.03	1.12	1.03	Deterministic Governs
0.100	1.19	1.31	1.19	Deterministic Governs
0.150	1.41	1.51	1.41	Deterministic Governs
0.200	1.55	1.61	1.55	Deterministic Governs
0.250	1.64	1.66	1.64	Deterministic Governs
0.300	1.69	1.63	1.63	Probabilistic Governs
0.400	1.68	1.52	1.52	Probabilistic Governs
0.500	1.58	1.40	1.40	Probabilistic Governs
0.750	1.26	1.07	1.07	Probabilistic Governs
1.000	1.00	0.81	0.81	Probabilistic Governs
1.500	0.66	0.51	0.51	Probabilistic Governs
2.000	0.47	0.36	0.36	Probabilistic Governs
3.000	0.30	0.24	0.24	Probabilistic Governs
4.000	0.22	0.18	0.18	Probabilistic Governs
5.000	0.17	0.15	0.15	Probabilistic Governs
7.500	0.10	0.09	0.09	Probabilistic Governs
10.000	0.06	0.06	0.06	Deterministic Governs

These comparisons are plotted in the following diagram:



◆ **Design Response Spectrum (ASCE 7 Section 21.3)-**

In accordance with Section 21.3, the Design Response Spectrum was developed by the following equation: $S_a = 2/3 S_{aM}$, where S_{aM} is the MCE_R spectral response acceleration obtained from Section 21.1 or 21.2. The design spectral response acceleration shall not be taken less than 80 percent of S_a . These are plotted and compared with 80% of the CBC Spectrum values in the following diagram:



◆ **Design Acceleration Parameters (ASCE 7 Section 21.4)-**

Where the site-specific procedure is used to determine the design ground motion in accordance with Section 21.3, the parameter S_{DS} shall be obtained from the site-specific spectra at a period of 0.2 s, except that it shall not be taken less than 90 percent of the peak spectral acceleration, S_a , at any period larger than 0.2 s. The parameter S_{D1} shall be taken as the greater of the products of $S_a * T$ for periods between 1 and 5 seconds. The parameters S_{MS} , and S_{M1} shall be taken as 1.5 times S_{DS} and S_{D1} , respectively. The values so obtained shall not be less than 80 percent of the values determined in accordance with Section 11.4.4 for S_{MS} , and S_{M1} and Section 11.4.5 for S_{DS} and S_{D1} .

◆ **Site Specific Design Parameters -**

For the 0.2 second period (S_{DS}), a value of 0.99g was computed, based upon the average spectral accelerations. The maximum average acceleration for any period exceeding 0.2 seconds was 1.10g occurring at $T=0.25$ seconds. This was multiplied by 0.9 to produce a value of 0.99g making this the applicable value. A value of 0.70g was calculated for S_{D1} at a period of 1 second (ASCE 7-16, 21.4). For the MCE_R 0.2 second period, a value of 1.480g (S_{MS}) was computed, along with a value of 1.052g (S_{M1}) for the MCE_R 1.0 second period was also calculated (ASCE 7-16, 21.2.3).

◆ **Site-Specific MCE_G Peak Ground Accelerations (ASCE 7 Section 21.5)-**

The probabilistic geometric mean peak ground acceleration (2 percent probability of exceedance within a 50-year period) was calculated as 0.66g. The deterministic geometric mean peak ground acceleration (largest 84th percentile geometric mean peak ground acceleration for characteristic earthquakes on all known active faults within the site region) was calculated as 0.64g. The site-specific MCE_G peak ground acceleration was calculated to be **0.64g**, which was determined by using the lesser of the probabilistic (0.66g) or the deterministic (0.64g) geometric mean peak ground accelerations, but not taken as less than 80 percent of PGA_M (i.e., $0.55g \times 0.80 = 0.44g$).

SEISMIC DESIGN PARAMETERS SUMMARY

Project: South Perris Fire Station
Project #: 254143-1
Date: 8/2/2025

Latitude: 33.75263
Longitude: -117.20584

CALIFORNIA BUILDING CODE CHAPTER 16/ASCE7-16

Mapped Acceleration Parameters per ASCE 7-16, Chapter 22

S_s	=	1.422	Figure 22-1
S_1	=	0.526	Figure 22-2

Site Class per Table 20.3-1

Site Class	=	D
------------	---	---

Site Coefficients per ASCE 7-16 CHAPTER 11

F_a	=	1	Table 11.4-1	=	1	For Site Specific Analysis per ASCE7-16 21.3
F_v	=	1.774	Table 11.4-2	=	2.50	For Site Specific Analysis per ASCE7-16 21.3

Mapped Design Spectral Response Acceleration Parameters

S_{MS}	=	1.422	Equation 11.4-1	=	1.422	For Site Specific Analysis per ASCE7-16 21.3
S_{M1}	=	0.933	Equation 11.4-2	=	1.315	For Site Specific Analysis per ASCE7-16 21.3

S_{DS}	=	0.948	Equation 11.4-3
S_{D1}	=	0.622	Equation 11.4-4

Period (T)	S_a (ASCE7-16 - 11.4.6)	80% General Design Spectrum	80% Modified Design Spectrum
0.01	0.38	0.30	0.33
0.13	0.95	0.76	0.60
0.20	0.95	0.76	0.76
0.66	0.95	0.76	0.76
0.70	0.89	0.71	0.76
0.80	0.78	0.62	0.76
0.90	0.69	0.55	0.76
1.00	0.62	0.50	0.70
1.10	0.57	0.45	0.64
1.20	0.52	0.41	0.58
1.30	0.48	0.38	0.54
1.40	0.44	0.36	0.50
1.50	0.41	0.33	0.47
1.60	0.39	0.31	0.44
1.70	0.37	0.29	0.41
1.80	0.35	0.28	0.39
1.90	0.33	0.26	0.37
2.00	0.31	0.25	0.35
3.00	0.21	0.17	0.23
4.00	0.16	0.12	0.18
5.00	0.12	0.10	0.14
7.50	0.08	0.07	0.09
10.00	0.05	0.04	0.06

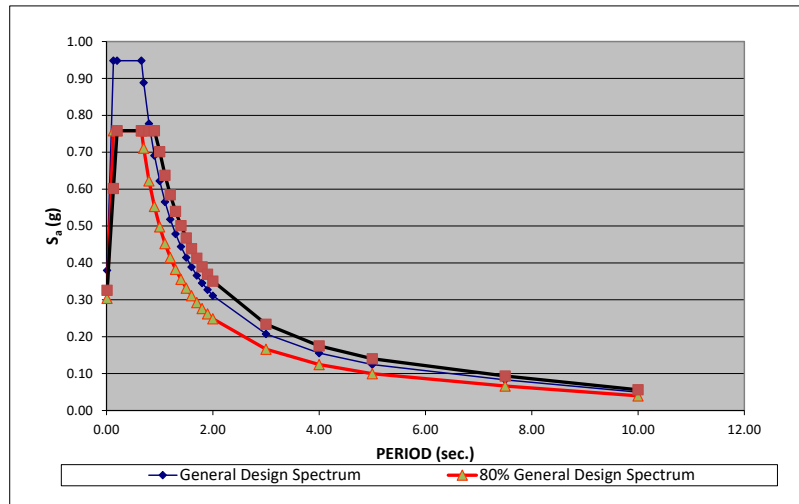
T_0	=	0.131	sec
T_S	=	0.656	sec
T_L	=	8	sec
PGA	=	0.5	g
F_{PGA}	=	1.1	
C_{RS}	=	0.938	
C_{R1}	=	0.92	

From Fig 22-12

From Table 11.8-1

Figure 22-17

Figure 22-18



ASCE 7-16 - RISK-TARGETED MAXIMUM CONSIDERED EARTHQUAKE GROUND MOTION ANALYSIS

Use Maximum Rotated Horizontal Component?* (Y/N)

Y

Maximum Rotated Horizontal Component determined per ASCE7-16 (Huang et al. 2008)

Presented data are the average of Chiou & Youngs (2014), Abrahamson et. al. (2014), Boore et. al (2014) and Campbell & Bozorgnia (2014) NGA West-2 Relationships

PROBABILISTIC MCER per 21.2.1.1

Method 1

Earthquake Rupture Forecast - UCERF3 FM 3.2

Risk Coefficients taken from Figures 22-18 and 22-19 of ASCE 7-16

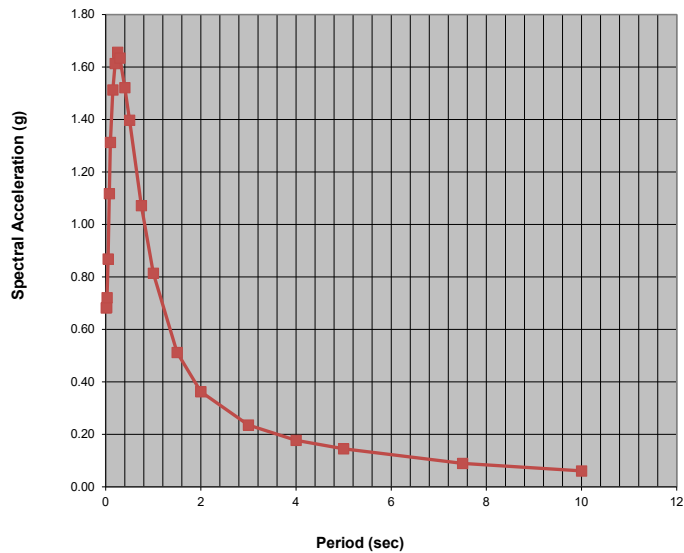
OpenSHA data

2% Probability Of Exceedance in 50 years

T	Sa in 50	C _R *	MCER
0.01	0.73	0.9380	0.68
0.02	0.73	0.9380	0.68
0.03	0.77	0.9380	0.72
0.05	0.93	0.9380	0.87
0.08	1.19	0.9380	1.12
0.10	1.40	0.9380	1.31
0.15	1.61	0.9380	1.51
0.20	1.72	0.9380	1.61
0.25	1.77	0.9369	1.66
0.30	1.75	0.9358	1.63
0.40	1.63	0.9335	1.52
0.50	1.50	0.9313	1.40
0.75	1.16	0.9256	1.07
1.00	0.88	0.9200	0.81
1.50	0.56	0.9200	0.51
2.00	0.39	0.9200	0.36
3.00	0.26	0.9200	0.24
4.00	0.19	0.9200	0.18
5.00	0.16	0.9200	0.15
7.50	0.10	0.9200	0.09
10.00	0.07	0.9200	0.06

* The risk coefficient C_r is interpolated between T=0.2 and 1.0 seconds. Where T<0.2 C_r=C_{RS}. Where T>1.0, C_r=C_{R1}

PROBABILISTIC GROUND MOTIONS



S _s =	1.72	1.61
S ₁ =	0.88	0.81
PGA	0.66 g	

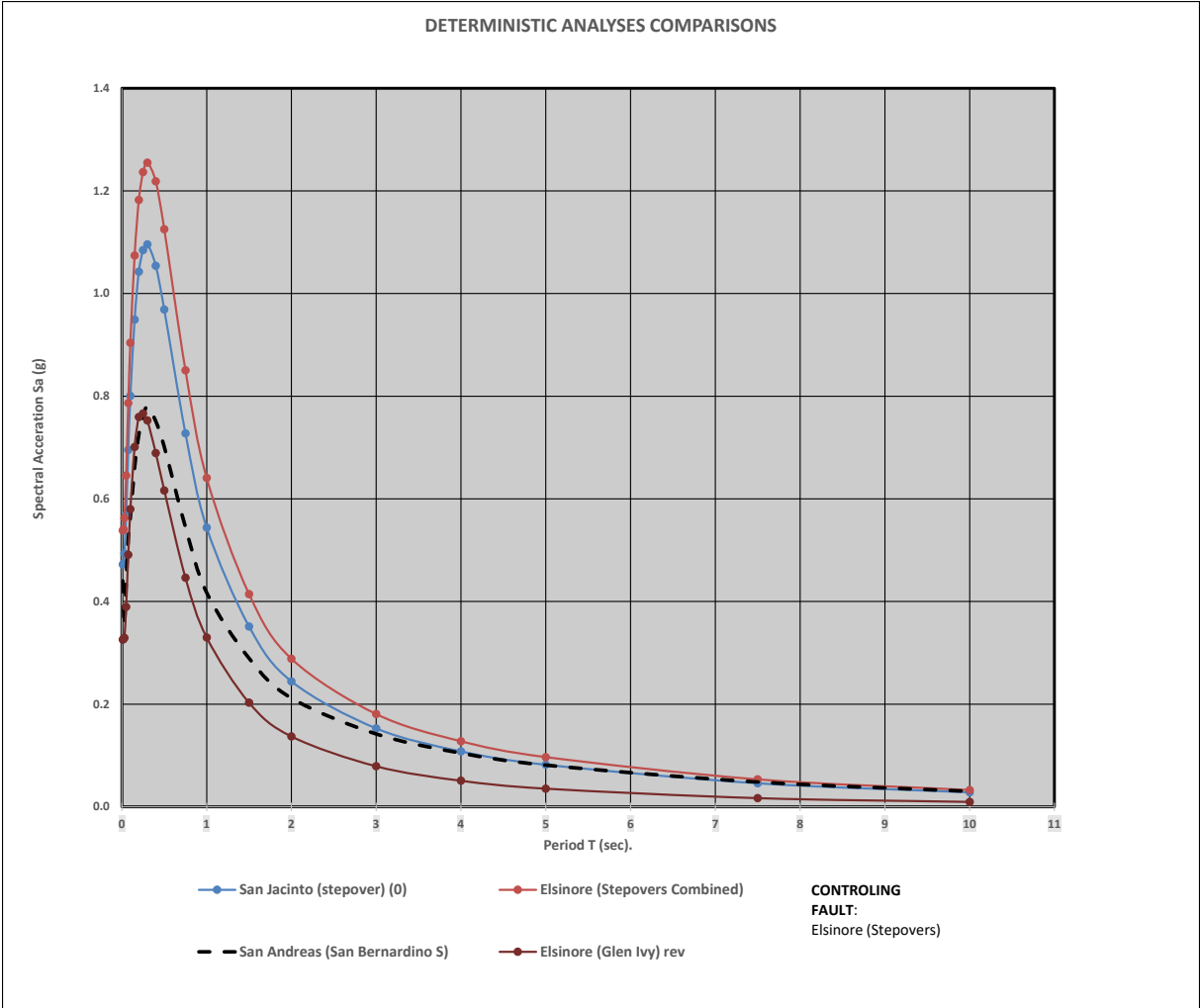
Risk Coefficients:			
C _{RS}	0.938	Figure 22-18	Get from Mapped Values
C _{R1}	0.92	Figure 22-19	
Fa=	1	Table 11.4-1	Per ASCE7-16 - 21.2.3
Is Sa _(max) <1.2XFa?	NO		If "YES", Probabilistic Spectrum prevails

DETERMINISTIC MCE per 21.2.2

Preliminary Assessment:

Fault	Distance (km)
San Jacinto (stepover) (0)	19.10
Elsinore (Stepovers Combined)	15.00
San Andreas (San Bernardino S)	40.20
Elsinore (Glen Ivy) rev	20.90

The Probalistic Analyses revealed four faults that contribute more than 10% to the seismic hazard. These faults were the subject of deterministic analyses.



Input Parameters		San Jacinto (stepover) (0)	Elsinore (Stepovers Combined)	San Andreas (San Bernardino S)	Elsinore (Glen Ivy) rev
Fault					
M	= Moment magnitude	7.8	7.8	8.1	6.8
R_{RUP}	= Closest distance to coseismic rupture (km)	19.1	15	40.2	20.9
R_{JB}	= Closest distance to surface projection of coseismic rupture (km)	19.1	15	40.2	20.9
R_X	= Horizontal distance to top edge of rupture measured perpendicular to strike (km)	19.1	15	40.2	20.9
U	= Unspecified Faulting Flag (Boore et.al.)	0	0	0	0
F_{RV}	= Reverse-faulting factor: 0 for strike slip, normal, normal-oblique; 1 for reverse, reverse-oblique and thrust	0	0	0	0
F_{NM}	= Normal-faulting factor: 0 for strike slip, reverse, reverse-oblique and thrust; 1 for normal and normal-oblique	0	0	0	0
F_{HW}	= Hanging-wall factor: 1 for site on down-dip side of top of rupture; 0 otherwise, used in AS08 and CY08	0	0	0	0
Z_{TOR}	= Depth to top of coseismic rupture (km)	0	0	0	0
d	= Average dip of rupture plane (degrees)	90	90	90	90
V_{S30}	= Average shear-wave velocity in top 30m of site profile	343.5	343.5	343.5	343.5
F_{Measured}		1	1	1	1
Z_{1.0}	= Depth to Shear Wave Velocity of 1.0 km/sec (km)	0.05	0.05	0.2	0.2
Z_{2.5}	= Depth to Shear Wave Velocity of 2.5 km/sec (km)	0.21	0.21	0.4	0.4
Site Class		D	D	D	D
W (km)	= Fault rupture width (km)	16.5	13.7	12.8	13.2
F_{AS}	= 0 for mainshock; 1 for aftershock	0	0	0	0
σ	=Standard Deviation	1	1	1	1

Deterministic Summary - Section 21.2.2 (Supplement 1)

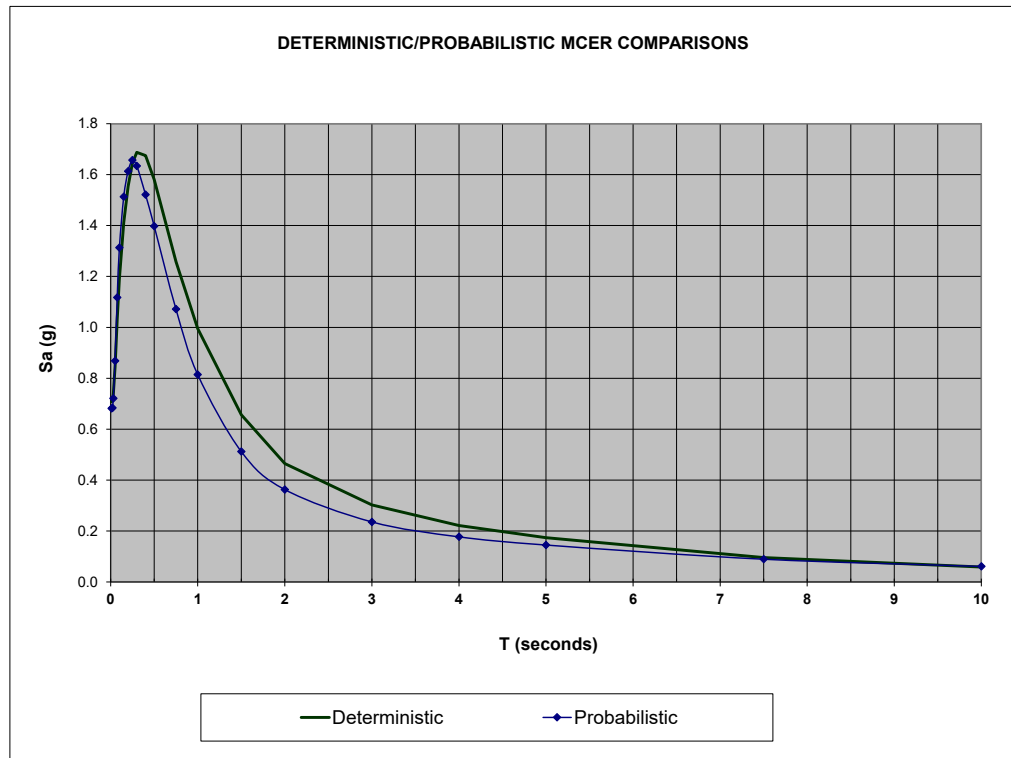
T	San Jacinto (stepover) (0)	Elsinore (Stepovers Combined)	San Andreas (San Bernardino S)	Elsinore (Glen Ivy) rev	Maximum S _a (Average)	Corrected* S _a (per ASCE7- 16)	Scaled S _a (Average)	Controlling Fault
0.010	0.47	0.54	0.44	0.33	0.54	0.59	0.71	Elsinore (Stepovers Combined)
0.020	0.47	0.54	0.39	0.33	0.54	0.59	0.71	Elsinore (Stepovers Combined)
0.030	0.49	0.56	0.35	0.33	0.56	0.62	0.74	Elsinore (Stepovers Combined)
0.050	0.57	0.65	0.44	0.39	0.65	0.71	0.85	Elsinore (Stepovers Combined)
0.075	0.70	0.79	0.52	0.49	0.79	0.87	1.03	Elsinore (Stepovers Combined)
0.100	0.80	0.90	0.56	0.58	0.90	0.99	1.19	Elsinore (Stepovers Combined)
0.150	0.95	1.07	0.66	0.70	1.07	1.18	1.41	Elsinore (Stepovers Combined)
0.200	1.04	1.18	0.73	0.76	1.18	1.30	1.55	Elsinore (Stepovers Combined)
0.250	1.08	1.24	0.76	0.77	1.24	1.38	1.64	Elsinore (Stepovers Combined)
0.300	1.10	1.25	0.78	0.75	1.25	1.41	1.69	Elsinore (Stepovers Combined)
0.400	1.05	1.22	0.75	0.69	1.22	1.40	1.68	Elsinore (Stepovers Combined)
0.500	0.97	1.13	0.70	0.62	1.13	1.32	1.58	Elsinore (Stepovers Combined)
0.750	0.73	0.85	0.54	0.45	0.85	1.05	1.26	Elsinore (Stepovers Combined)
1.000	0.54	0.64	0.42	0.33	0.64	0.83	1.00	Elsinore (Stepovers Combined)
1.500	0.35	0.41	0.29	0.20	0.41	0.55	0.66	Elsinore (Stepovers Combined)
2.000	0.24	0.29	0.21	0.14	0.29	0.39	0.47	Elsinore (Stepovers Combined)
3.000	0.15	0.18	0.14	0.08	0.18	0.25	0.30	Elsinore (Stepovers Combined)
4.000	0.11	0.13	0.10	0.05	0.13	0.19	0.22	Elsinore (Stepovers Combined)
5.000	0.08	0.10	0.08	0.04	0.10	0.15	0.17	Elsinore (Stepovers Combined)
7.500	0.05	0.05	0.05	0.02	0.05	0.08	0.10	Elsinore (Stepovers Combined)
10.000	0.03	0.03	0.03	0.01	0.03	0.05	0.06	Elsinore (Stepovers Combined)
PGA	0.47	0.54	0.34	0.31	0.54		0.64	g
Max Sa=	1.25							
Fa =	1.00	Per ASCE7-16 21.2.2						
1.5XFa=	1.5							
Scaling Factor=	1.20							

* Correction is the adjustment for Maximum Rotated Value if Applicable

SITE SPECIFIC MCE_R - Compare Deterministic MCE_R Values (S_a) with Probabilistic MCE_R Values (S_a) per 21.2.3

Presented data are the average of Chiou & Youngs (2014), Abrahamson et. al. (2014) , Boore et. al (2014) and Campbell & Bozorgnia (2014) NGA West-2 Relationships

Period	Deterministic	Probabilistic	Lower Value (Site Specific MCE _R)	Governing Method
T	MCE _R	MCE _R		
0.010	0.71	0.68	0.68	Probabilistic Governs
0.020	0.71	0.68	0.68	Probabilistic Governs
0.030	0.74	0.72	0.72	Probabilistic Governs
0.050	0.85	0.87	0.85	Deterministic Governs
0.075	1.03	1.12	1.03	Deterministic Governs
0.100	1.19	1.31	1.19	Deterministic Governs
0.150	1.41	1.51	1.41	Deterministic Governs
0.200	1.55	1.61	1.55	Deterministic Governs
0.250	1.64	1.66	1.64	Deterministic Governs
0.300	1.69	1.63	1.63	Probabilistic Governs
0.400	1.68	1.52	1.52	Probabilistic Governs
0.500	1.58	1.40	1.40	Probabilistic Governs
0.750	1.26	1.07	1.07	Probabilistic Governs
1.000	1.00	0.81	0.81	Probabilistic Governs
1.500	0.66	0.51	0.51	Probabilistic Governs
2.000	0.47	0.36	0.36	Probabilistic Governs
3.000	0.30	0.24	0.24	Probabilistic Governs
4.000	0.22	0.18	0.18	Probabilistic Governs
5.000	0.17	0.15	0.15	Probabilistic Governs
7.500	0.10	0.09	0.09	Probabilistic Governs
10.000	0.06	0.06	0.06	Deterministic Governs



DESIGN RESPONSE SPECTRUM per Section 21.3

DESIGN ACCELERATION PARAMETERS per Section 21.4 (MRSA)

Period	$2/3 \cdot MCE_R$	80% Modified Design Response Spectrum (per ASCE 7-16 23.3-1)	Design Response Spectrum	TXSa
0.01	0.45	0.33	0.45	
0.02	0.46	0.35	0.46	
0.03	0.48	0.37	0.48	
0.05	0.57	0.42	0.57	
0.08	0.69	0.47	0.69	
0.10	0.79	0.53	0.79	
0.15	0.94	0.64	0.94	
0.20	1.04	0.76	1.04	
0.25	1.10	0.76	1.10	
0.30	1.09	0.76	1.09	
0.40	1.01	0.76	1.01	
0.50	0.93	0.76	0.93	
0.75	0.71	0.76	0.76	
1.00	0.54	0.70	0.70	0.70
1.50	0.34	0.47	0.47	0.70
2.00	0.24	0.35	0.35	0.70
3.00	0.16	0.23	0.23	0.70
4.00	0.12	0.18	0.18	0.70
5.00	0.10	0.14	0.14	0.70
7.50	0.06	0.09	0.09	
10.00	0.04	0.06	0.06	

Highest value of S_a for any period exceeding 0.2 sec. =	1.10
90% of Highest Value =	0.99
80% of Mapped S_{DS} =	0.76
Maximum TXSa from $T=1s-5s$ =	0.70
80% of Mapped S_{D1} =	0.50

S_{DS} =	0.99
S_{D1} =	0.70
T_s =	0.71

S_{MS} =	1.480
S_{M1} =	1.052

PGA Determination:

Site Coefficient F_{PGA} = 1.1

Mapped PGA = 0.50 Figure 22-7

PGA_M = 0.55 g

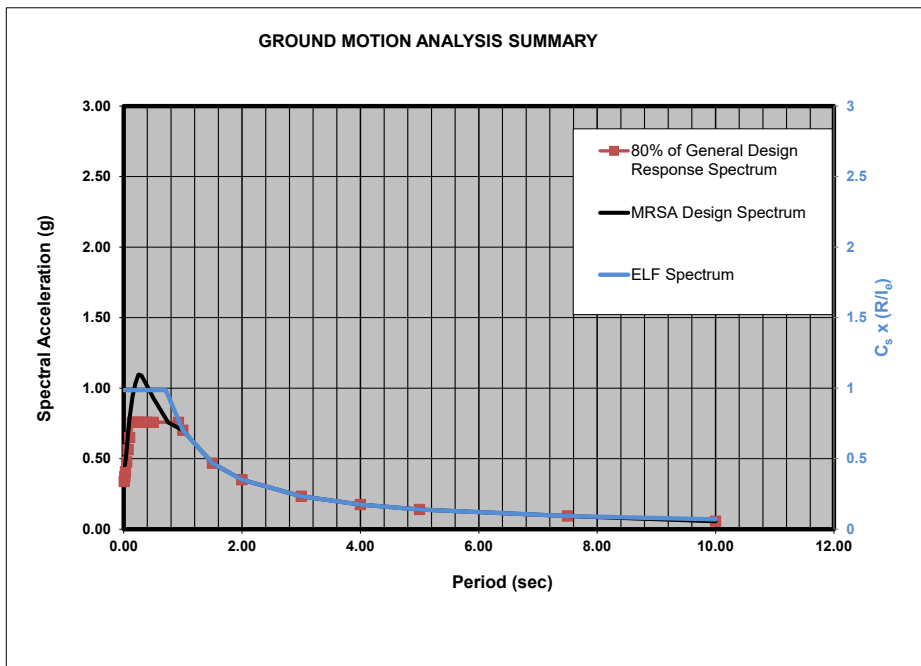
Deterministic PGA = 0.64 g

Probabilistic PGA = 0.66 g

Lesser of Deterministic/Probabilistic = 0.64 g

80% of PGA_M = 0.44 g

MCE_G PGA = 0.64 g



SUMMARY OF SITE SPECIFIC GROUND MOTION HAZARD ANALYSIS DATA

1	2	3		4	5	6	7	8	9	10	11	12
Period (sec)	Mapped MCE _R Spectrum	Mapped Design Spectrum	Period (sec)	Risk Coefficient C _R	Scaled MCE _R Deterministic Spectrum	Probabilistic MCE _R Spectrum	Probabilistic w/Risk Coefficient C _R	84th Percentile Deterministic Spectrum	2/3 Site Specific MCE _R Spectrum	80% of Modified Design Spectrum	Site Specific MCE _R Spectrum	Design Response Spectrum
0.01	0.57	0.38	0.01	0.938	0.59	0.68	0.68	0.59	0.45	0.33	0.68	0.45
0.13	1.42	0.95	0.02	0.938	0.59	0.68	0.68	0.59	0.46	0.35	0.68	0.46
0.20	1.42	0.95	0.03	0.938	0.62	0.72	0.72	0.62	0.48	0.37	0.72	0.48
0.66	1.42	0.95	0.05	0.938	0.71	0.87	0.87	0.71	0.57	0.42	0.85	0.57
0.70	1.33	0.89	0.08	0.938	0.87	1.12	1.12	0.87	0.69	0.47	1.03	0.69
0.80	1.17	0.78	0.10	0.938	0.99	1.31	1.31	0.99	0.79	0.53	1.19	0.79
0.90	1.04	0.69	0.15	0.938	1.18	1.51	1.51	1.18	0.94	0.64	1.41	0.94
1.00	0.93	0.62	0.20	0.938	1.30	1.61	1.61	1.30	1.04	0.76	1.55	1.04
1.10	0.85	0.57	0.25	0.937	1.38	1.66	1.66	1.38	1.10	0.76	1.64	1.10
1.20	0.78	0.52	0.30	0.936	1.41	1.63	1.63	1.41	1.09	0.76	1.63	1.09
1.30	0.72	0.48	0.40	0.934	1.40	1.52	1.52	1.40	1.01	0.76	1.52	1.01
1.40	0.67	0.44	0.50	0.931	1.32	1.40	1.40	1.32	0.93	0.76	1.40	0.93
1.50	0.62	0.41	0.75	0.926	1.05	1.07	1.07	1.05	0.71	0.76	1.14	0.76
1.60	0.58	0.39	1.00	0.920	0.83	0.81	0.81	0.83	0.54	0.70	1.05	0.70
1.70	0.55	0.37	1.50	0.920	0.55	0.51	0.51	0.55	0.34	0.47	0.70	0.47
1.80	0.52	0.35	2.00	0.920	0.39	0.36	0.36	0.39	0.24	0.35	0.53	0.35
1.90	0.49	0.33	3.00	0.920	0.25	0.24	0.24	0.25	0.16	0.23	0.35	0.23
2.00	0.47	0.31	4.00	0.920	0.19	0.18	0.18	0.19	0.12	0.18	0.26	0.18
3.00	0.31	0.21	5.00	0.920	0.15	0.15	0.15	0.15	0.10	0.14	0.21	0.14
4.00	0.23	0.16	7.50	0.920	0.08	0.09	0.09	0.08	0.06	0.09	0.14	0.09
5.00	0.19	0.12	10.00	0.920	0.05	0.06	0.06	0.05	0.04	0.06	0.08	0.06
7.50	0.12	0.08										
10.00	0.07	0.05										

APPENDIX C

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Appendix “B”

ON-SITE WASTEWATER TREATMENT SYSTEM REPORT



September 23, 2025
Project No. S168-196

STK Architecture, Inc.
42095 Zeno Drive, Suite A15
Temecula, California 92590

Attention: Tony Finaldi

Subject: Onsite Wastewater Treatment System Report
South Perris Fire Station CIP F077
Murrieta Road
Perris, California
A.P.N. 327-210-016
County P.R. No. 9836

Dear Mr. Finaldi:

This report presents the results of the onsite wastewater treatment system (OWTS) evaluation for the proposed South Perris fire station on the east side of Murrieta Road in Perris, California. Our services were performed in accordance with the current requirements of the County of Riverside, Department of Environmental Health (County) and contemporary soil engineering principles and practice. We make no other warranty, either expressed or implied.

Project and Site Description

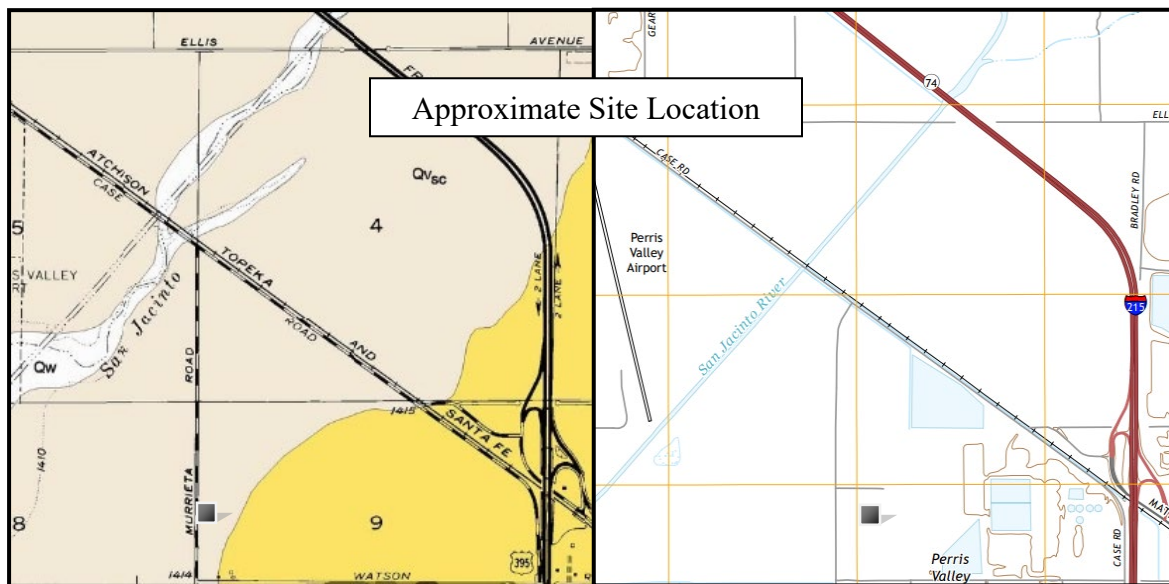
The project will consist of the construction of two new structures. The new fire station will occupy approximately 10,900 square feet. It will be constructed in the south portion of the project site and will house 10 full-time firefighters.

An administration building will be constructed in the north portion of the site that will occupy approximately 5,200 square feet. It will have an average of 10 full-time employees.

The project is located on the east side of Murrieta Road, in Perris, California. It is located approximately 640 feet north of Watson Road. It is bounded to the north, south, and east by alfalfa fields and to the west by Murrieta Road.

Following is a USGS topographic map and aerial photograph showing the site location.

U.S.G.S. Perris 7.5' Quadrangle, and Geologic Map (2021)



The project site occupies approximately 3.4 acres.

The project site slopes very gently to the southwest at approximately 1 percent. Most of the site has been cleared of the alfalfa fields and been disced. The surrounding area is currently alfalfa fields.

EMWD is constructing a pump station across the street. No water wells, significant rock out crops, or other impediments to subsurface wastewater disposal were observed or are known to exist in the immediate site vicinity. Existing site vegetation consists of alfalfa.

Groundwater

Exploratory borings B-02 (51.5'), B-05(51.5') and B-07 (17') were drilled for the project geotechnical and percolation investigation and were in the immediate vicinity of the proposed OWTS. Groundwater in B-02 and B-05 was encountered at initially 45.5 feet and 46 feet, respectively and stabilized after drilling to 40.5 feet and 41 feet, respectively. Soil mottling was observed in B-02 and B-05 at 35 feet and 41 feet, respectively. A perforated pipe was installed in boring B-07 before backfilling.

Percolation Testing

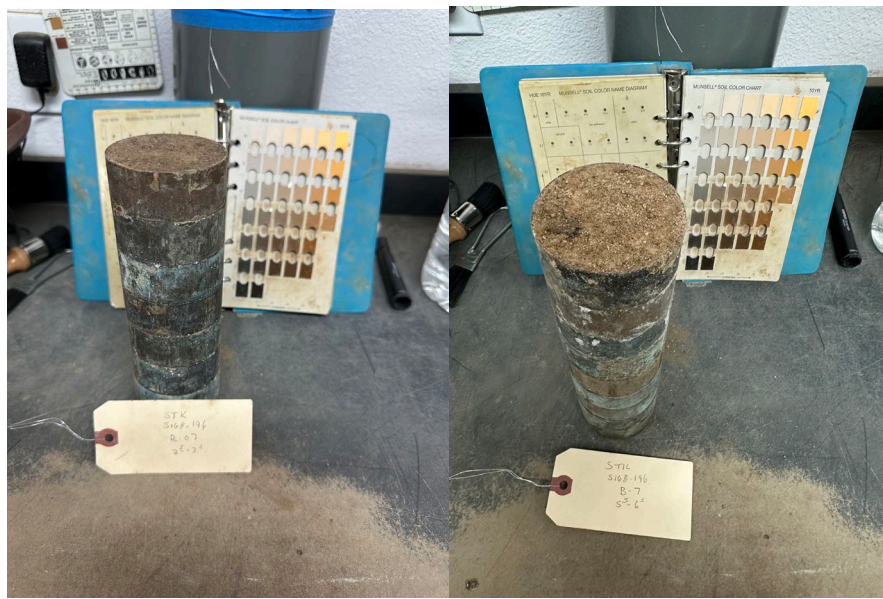
Percolation testing was conducted on July 31, August 1,3, and 4 and consisted of four percolation tests at depths of 36, 48, 60, and 72 inches below the existing

ground surface. Holes were presoaked by inverting a 5-gallon bottle of clear water over the holes for a minimum of 15 hours. After presoaking, a sandy soil test was conducted. The results showed that the soil does not meet the sandy soil criteria. The testing was then performed for a period of 6 hours, with measurements taken at 30-minute intervals. The results of the testing are shown below, and copies of the percolation test sheets are appended to this report.

Percolation Test Summary

Hole No.	Depth (in.)	Rate (min/inch)
P-01	48	17
P-02	60	30
P-03	36	60
P-04	72	60

Pictures of soil encountered in Boring B-07 during drilling of the deep boring are shown below. Drive ring samples were taken at 3-foot intervals.





Discussion

Table H 201.1(3) of the 2022 California Plumbing Code (UPC) was used to estimate a minimum waste/sewage flow rate of 125 gallons per day per firefighter for the fire station. An estimated flow rate of 20 gallons per day per employee was used for the administration building. Calculations show that a 2,000-gallon tank will accommodate 10 employees for the administration building. A 3,500-gallon septic tank will accommodate 10 firefighters for the fire station.

Septic System Design

Septic Tank

Separate septic tanks will be utilized for each building. One septic tank will be located in a planter area southeast of the administrative building. The other will be located in a planter area northeast of the fire station. The septic tank should have a minimum nominal capacity of 2,000 gallons for the administration building 1 and 3,500 gallons for the fire station. It should be IAPMO approved, and be installed per the current California Plumbing Code and all other local requirements and regulations. We recommend that the tanks be equipped with risers to facilitate access.

Disposal Field

The purpose of the disposal field is to release the wastewater into the soil at the prescribed percolation rate. The disposal field for the administration building will consist of five (5) leach lines, each 96 feet long, with 2 feet of rock below the drain lines. The disposal field for the fire station will consist of nine (9) leach lines, each 94 feet long, with two feet of rock below the drain lines. The leach lines should be installed where indicated on the plan and in accordance with the current California Plumbing Code and all other applicable requirements. An expansion area consisting of dedicated space equal in size to the proposed OWTS should be set aside to replace the primary OWTS, if necessary, at a later date. The proposed expansion areas for the two buildings are shown on the site plan.

Conclusions

Based on our testing at the site, subsurface disposal consisting of an onsite wastewater treatment system (OWTS) at this site is feasible. This is provided that the OWTS is constructed as recommended in this report. The attached site plan indicates the locations of the components of the treatment system. The location of the OWTS system should not deviate from the area depicted in the design. The area of the proposed OWTS should not be subject to any traffic or compaction. No grading or equipment traffic in the OWTS area should be performed.

Limitations

The findings and recommendations provided in this report are based on an interpolation of subsurface conditions between test and boring locations. The data obtained from the various points of observation and testing may only be representative of the condition at those specific locations. Therefore, conditions may be encountered during construction that appear to be different than those indicated herein. We cannot assume any

responsibility for such unforeseen conditions but should be notified if they occur in order to determine the necessity of revising our recommendations. Our conclusions presented concerning groundwater are based on our field observations, a limited literature review, and our knowledge of the general area. Therefore, our opinions are based on limited data and may not accurately represent future or historical groundwater levels. The Health Department may have more thorough records, which may provide a more accurate representation of prior groundwater levels in the area. A review of such records is not within the scope of services normally provided for an investigation of this type.

"Based on the data presented in the report and using the recommendations set forth, it is the judgment of this professional that there is sufficient area on each lot to support a primary and expansion OWTS that will meet the current standards of the Department of Environmental Health and the Regional Water Quality Control Board (RWQCB)." *

"The designed system shall be located in natural undisturbed soil at the depth of the tests performed." *

"The natural occurring body of mineral and organic matter at the proposed wastewater disposal area contains earthen materials having more than 50% of its volume composed of particles smaller than 0.08 inches (2mm) in size." *

"Based on the data presented in the report and the testing information accumulated, it is the judgment of this professional that the groundwater table will not encroach within the current allowable limit set forth by County and State requirements." *

We appreciate being of service to you on this project. If you any questions, please contact our office.

Respectfully,

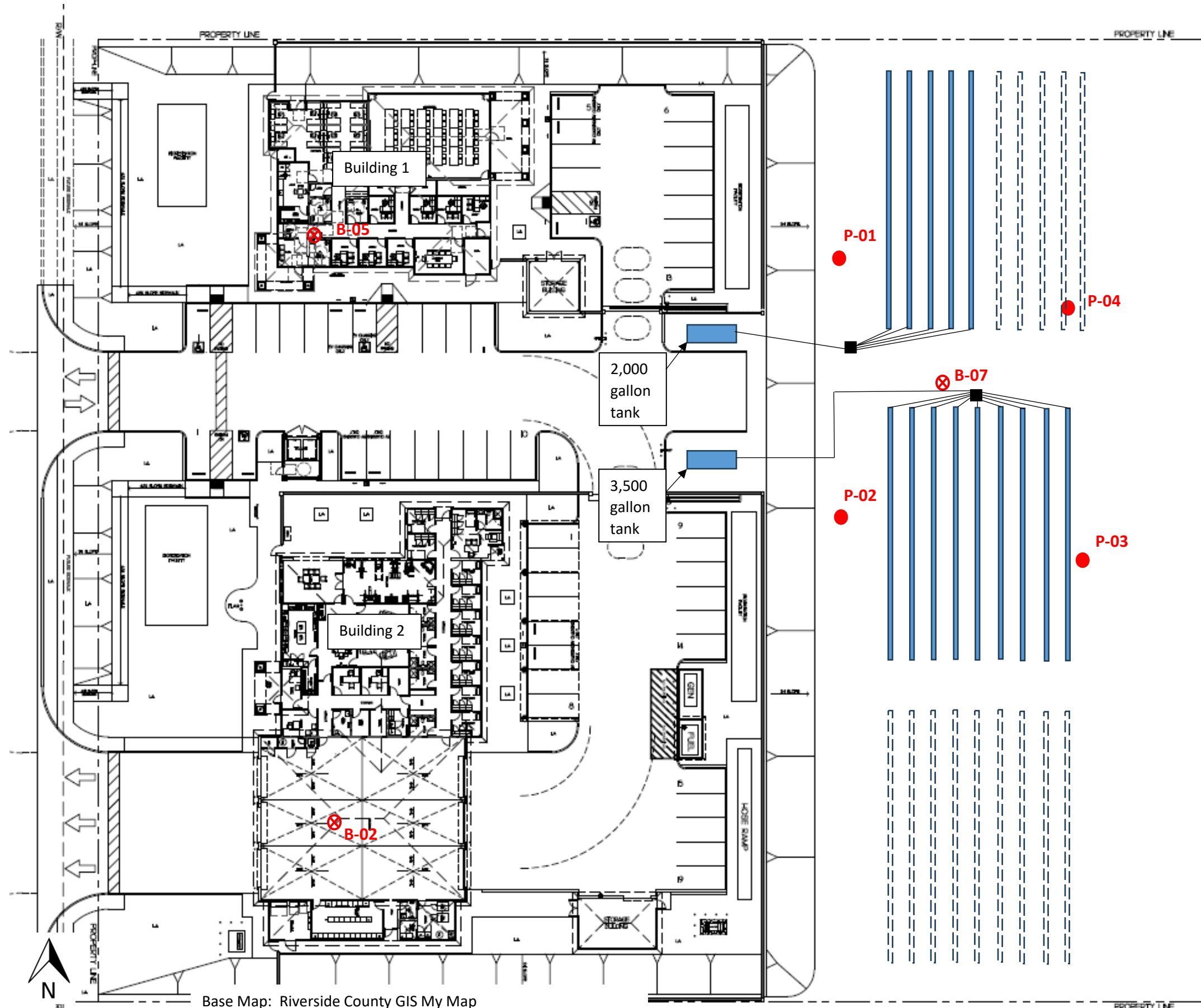
INLAND FOUNDATION ENGINEERING, INC.



Allen D. Evans, P.E., G.E.
Principal

FWC:ADE:sd

SITE PLAN
South Perris Fire Station
Murrieta Road
Perris, California



Base Map: Riverside County GIS My Map

- Approximate Location of Percolation Test
- ⊗ Approximate Boring Location

IFE

Inland Foundation Engineering, Inc.

1310 S. Santa Fe Avenue, San Jacinto, CA 92583 | (951) 654-1555

Figure
No. 1

STK Architecture, Inc.
South Perris Fire Station
Murrieta Road, Perris, CA

Drawn By: SD
Scale 1" = 40'

Project No. S168-196
Date: September 2025

LEACH LINE PERCOLATION DATA SHEET

Project: STK – South Perris Fire Station	Project No.: S168-196
Test Hole No.: P-1	Date: 8/4/2025
Depth of Test Hole: 48"	Date Excavated: 7/31/2025
Check for Sandy Soil Criteria Tested by: FWC	Presoak: 5 gallons; 8/1 & 8/3
Actual Percolation Tested By: FWC	Soil Classification: Clayey Sand

SANDY SOIL CRITERIA TEST

Use: Normal Sandy (Circle One) Soil Criteria

[illegible]

LEACH LINE PERCOLATION DATA SHEET

Project: STK – South Perris Fire Station	Project No.: S168-196
Test Hole No.: P-2	Date: 8/4/2025
Depth of Test Hole: 60"	Date Excavated: 7/31/2025
Check for Sandy Soil Criteria Tested by: FWC	Presoak: 5 gallons; 8/1 & 8/3
Actual Percolation Tested By: FWC	Soil Classification: Clayey Sand

SANDY SOIL CRITERIA TEST

Use: Normal Sandy (Circle One) Soil Criteria

[illegible]

LEACH LINE PERCOLATION DATA SHEET

Project: STK – South Perris Fire Station	Project No.: S168-196
Test Hole No.: P-3	Date: 8/4/2025
Depth of Test Hole: 36"	Date Excavated: 7/31/2025
Check for Sandy Soil Criteria Tested by: FWC	Presoak: 5 gallons; 8/1 & 8/3
Actual Percolation Tested By: FWC	Soil Classification: Clayey Sand

SANDY SOIL CRITERIA TEST

Use: Normal Sandy (Circle One) Soil Criteria

Time	Time Interval (min.)	Total Elapsed Time (min.)	Initial Water Level (in.)	Final Water Level (in.)	▲ in Water Level (in.)	Percolation Rate (min./in.)
7:14	60	60	39.0	29.5	1.5	40
8:14						
8:14						
9:14	60	120	40.0	29.0	1.0	60
9:14						
10:14						
10:15	60	180	40.0	29.0	1.0	60
11:15						
11:15						
12:15	60	240	40.0	29.0	1.0	60
12:15						
1:15						
	60	300	40.0	29.0	1.0	60
	60	360	40.0	29.0	1.0	60

LEACH LINE PERCOLATION DATA SHEET

Project: STK – South Perris Fire Station	Project No.: S168-196
Test Hole No.: P-4	Date: 8/4/2025
Depth of Test Hole: 72"	Date Excavated: 7/31/2025
Check for Sandy Soil Criteria Tested by: FWC	Presoak: 5 gallons; 8/1 & 8/3
Actual Percolation Tested By: FWC	Soil Classification: Clayey Sand

SANDY SOIL CRITERIA TEST

Use: Normal Sandy (Circle One) Soil Criteria

[illegible]

Appendix “C”
EXERCISE EQUIPMENT

**CONTRACTOR SHALL PURCHASE AND INSTALL ALL EXERCISE
EQUIPMENT SHOWN HEREIN - NO SUBSTITUTIONS ALLOWED**



advanced exercise

advancedexercise.com | 861 SouthPark Drive #100, Littleton, CO 80120 | 800.520.1112

CONSULTANT

Jarrett Tooley
jtooley@advancedexercise.com
Phone: 310.409.3732
Fax: 303.996.0063

Date: January 22, 2026
Quote Expires: 30 day(s)
Proposal # 093260-R1

BILL TO



South Perris Fire Station 105
Murrieta and Watson
Perris, 92570

SHIP TO

South Perris Fire Station 105
Murrieta and Watson
Perris, 92570






CARDIO EQUIPMENT

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
IC-LFICGIC7-01	ICG	Life Fitness ICG IC7 Indoor Cycle 	<ul style="list-style-type: none">• WattRate full color TFT computer screen• Bluetooth & ANT+ connect technology• Coach By Color• Self powered generator• Magnetic resistance• Steel frame• Full frame shrouds• Ergo-formed soft PVC handlebars• Unisex padded sport saddle• Max user weight: 330lbs• Dimensions: 52" x 20.5" x 40.2"	3,327.20	1	\$3,327.20
ADX-0A	True Fitness	True ADX (Black) 	<ul style="list-style-type: none">• 26-blade performance fan• Single stage belt for instant activation• Self-powered console• LCD tachometer display• Calibration technology• Moisture-repellant, double-coated steel construction• Max user weight 350lbs• Machineweight 113lbs• Dimensions: 26"W x 55"L x 53"H	1,169.35	2	\$2,338.70




advanced exercise

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
TC1S350L0	True Fitness	Stryker Slat Treadmill - UNITE LED Console 	<ul style="list-style-type: none">• Large LED Display• 8 Data Points of Workout Feedback• 10 Key Pin Pad for Quick Changes• 62 vulcanized rubber slats• Speed range 1 to 12 MPH• Incline/decline range 0% to 25% (-3% to 22% with decline)• Mechanical thumb switches and center pod with quick keys• Extended handrails with molded rubber moisture resistant grips• Contact heart rate monitoring• Deck step-up height 13"• Running surface 22" x 60"• Power source: 120V/16A dedicated (NEMA 5-20 receptacle)• Max user weight 500lbs• Machine weight 599lbs• Dimensions: 72"L x 35"W x 64" H	12,349.35	1	\$12,349.35
00604500-35	True Fitness	Stryker Decline Kit	<ul style="list-style-type: none">• Decline Kit for Styker Slat Treadmill• -3%-22% Decline & Incline	64.35	1	\$64.35
2715	Concept 2	SkiErg with PM5 Monitor 	<ul style="list-style-type: none">• NOTE: The optional wall mounting for this item is not provided by Advanced Exercise• Black powder coated frame• Requires wall mounting unless optional floor stand is purchased• Includes PM5 NOTE: The optional wall mounting for this item is not provided by Advanced Exercise• Monitor• Wireless Heart Rate via ANT+ & Bluetooth Smart• Heart Rate transmitter not included• Ergonomic strapless handles• 20.5" W x 16" D x 83.5" H (Wall Mounted)• Unit weight 46lbs.	850.00	1	\$850.00
2720	Concept 2	SkiErg Standard Floor Stand 	<ul style="list-style-type: none">• Stand for 2715 SkiErg to make unit free standing	220.00	1	\$220.00



advanced exercise

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
2712	Concept 2	Standard RowErg with PM5 Monitor (14 inch high seat) 	<ul style="list-style-type: none">• Black powder coated frame• Includes PM5 Monitor• Wireless Heart Rate via ANT+ & Bluetooth Smart• Heart Rate transmitter not included• Adjustable Footrest & Ergonomic Handle• Low profile design 14" seat height• Quick release frame lock & casters for storage• 96" L x 24" W x 14" Seat Height• Unit weight 57lbs.	990.00	1	\$990.00








STRENGTH EQUIPMENT

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
HDU-MAB	Hammer Strength	Multi Adjustable Bench 	<ul style="list-style-type: none">• Size (L x W x H): Footprint (L x W x H): 52.5" x 22.2" x 18.5"• Weight: 85 lbs• Back pad adjusts from -10 to 15, 30, 45, 60 and 75-degree pressing angles• Seat pad adjusts from 0 to 30 degrees	1,040.40	2	\$2,080.80
PL-CALF	Hammer Strength	Seated Calf Raise 	<ul style="list-style-type: none">• 11-gauge steel frame with powder coat finish• Thigh pad restraint adjusts to accommodate different user sizes• Two areas to load plates• Plate Loaded with 60 lb. starting resistance• Made in USA• 50"L x 30"W x 55"H• Machine weight: 200 lbs	1,904.00	1	\$1,904.00
PL-BSQ	Hammer Strength	Hammer Strength Plate Loaded Belt Squat 	<ul style="list-style-type: none">• Front and rear weight rods for increased load• 4 belt anchor points• Belt and hook storage hanger• Dimensions 78"D x 63"W x 64"H• Weight 425lbs	5,087.25	1	\$5,087.25
PL-BSQ-4002	Hammer Strength	Belt Squat Optional Dip Attachment		669.80	1	\$669.80





advanced exercise

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
CMDAP	Life Fitness	Signature Series Cable Motion Dual Adjustable Pulley 	<ul style="list-style-type: none">• Oval frame 11-gauge tubing with powder coat finish• 1" solid steel weight plates• Rear weight stack shrouds• 22 adjustment positions per column• 1:4 resistance ratio• 3 position pull up station• Accessory kit & storage included• Machine Weight: 1,265lb.• Weight Stack: 2 x 390lb.• Dimensions with pull-up handles: 44"L x 62"W x 95"H• Made in USA	7,659.20	1	\$7,659.20
OP-LCE	Life Fitness	Axiom Leg Curl/Extension 	<ul style="list-style-type: none">• 11-gauge oval tubing steel frames• Low Profile 53 inch tower height• Solid Steel Weight stacks with 7.5 lb drop down increment weight• Placards with QR code/ NFC Chip, for product usage instructions• Integrated storage in Tower top cap• Standard rear shroud and optional full shroud	3,799.20	1	\$3,799.20
HDU-DPR	Hammer Strength	HD Universal Dual Pulldown Row 		4,487.20	1	\$4,487.20
SMSS-CORE	Life Fitness	Signature Modular Storage System - Core 	<ul style="list-style-type: none">• Weight: 80 lbs (36 kg)• Depth 27.3" x 53.5" x 73" (69 x 136 x 1856 cm)	988.00	1	\$988.00
SMSS-ACT	Life Fitness	Accessory Shelf 	<ul style="list-style-type: none">• Ideal for general accessory storage including Kettlebells, slam bags, hex/non-rolling dumbbells, med balls, wall balls, foam rollers, etc.• Usable flat surface space: 46" x 13" (116 cm x 33cm)	459.20	4	\$1,836.80




advanced exercise

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
SMSS-DR	Life Fitness	Dual Rail Shelf	<ul style="list-style-type: none">• Ideal for ball storage• 5.75" (15 cm) between rails	287.20	1	\$287.20
						
HDU-PCOR	Hammer Strength	HD Universal Perimeter Core		2,253.35	1	\$2,253.35
						
HDU-COR-WTH-42SD	Hammer Strength	HDU Core Width 42in / 107cm With Super Duty XM		0.00	1	\$
HDU-PU-4FT-SQ	Hammer Strength	42in/107Cm Square		0.00	1	\$
HDU-SP1-72-DR	Hammer Strength	72in / 213cm Dual Rail		282.20	1	\$282.20
HDU-SP2-72-DT	Hammer Strength	72in / 213cm Dumbbell Tray		342.55	1	\$342.55
HDU-SP3-72-DT	Hammer Strength	72in / 213cm Dumbbell Tray		342.55	1	\$342.55
HDU-SP4-72-AT	Hammer Strength	72in / 213cm Accessory Tray		342.55	1	\$342.55
HDU-PU-6FT-MB	Hammer Strength	72in/183Cm Monkeybar		0.00	1	\$
HDU-ADPSF	Hammer Strength	HD Universal Perimeter Add		1,330.25	1	\$1,330.25
HDU-CON-STA-PSF	Hammer Strength	Perimeter Side Frame		0.00	1	\$
HDU-ADD-WTH-72	Hammer Strength	HDU Add Width 72in / 183cm		0.00	1	\$
HDU-PU-6FT-MB	Hammer Strength	72in/183Cm Monkeybar		0.00	1	\$
HDU-SP1-72-DR	Hammer Strength	72in / 213cm Dual Rail		282.20	1	\$282.20

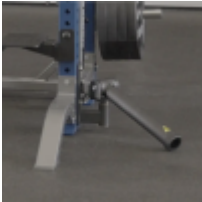



advanced exercise

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
HDU-SP2-72-DT	Hammer Strength	72in / 213cm Dumbbell Tray		342.55	1	\$342.55
HDU-SP3-72-DT	Hammer Strength	72in / 213cm Dumbbell Tray		342.55	1	\$342.55
HDU-SP4-72-AT	Hammer Strength	72in / 213cm Accessory Tray		342.55	1	\$342.55
HDU-ADPSF	Hammer Strength	HD Universal Perimeter Add		1,330.25	1	\$1,330.25
HDU-CON-STAPSF	Hammer Strength	Perimeter Side Frame		0.00	1	\$
HDU-ADD-WTH-42SD	Hammer Strength	HDU Add Width 42in / 107cm With Super Duty XM		0.00	1	\$
HDU-PU-4FT-SQ	Hammer Strength	42in/107Cm Square		0.00	1	\$
HDU-SP1-NON	Hammer Strength	None		0.00	1	\$
HDU-ADPSF	Hammer Strength	HD Universal Perimeter Add		1,330.25	1	\$1,330.25
HDW-BSS	Hammer Strength	Standard Bar Support (Pair)		183.60	2	\$367.20
HDW-HR-SBC	Hammer Strength	Standard Half Rack Bar Catch (Pair)		357.85	2	\$715.70
						
HDU-WHS	Hammer Strength	Standard Length Weight Horn (Pair)	<ul style="list-style-type: none">Weight horn storageSize (L x W x H): 8.5" x 2" x 8"	79.05	3	\$237.15
HDU-WHXL	Hammer Strength	XL Length Weight Horn (Pair)	<ul style="list-style-type: none">XL weight horn storageSize (L x W x H): 8.5" x 2" x 12"	106.25	2	\$212.50
HDU-2BH	Hammer Strength	2 Bar Storage Hanger	<ul style="list-style-type: none">Holds two barbells for convenient storageMounts to uprights	107.10	2	\$214.20
HDU-DRBD	Hammer Strength	Dual Rail Bumper Plate Divider		195.50	2	\$391.00



advanced exercise

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
HDU-PPF	Hammer Strength	Power Pivot (Bolt On) 	<ul style="list-style-type: none">Provides rotating mount for barbellSize (L x W x H): 21.7" x 4.5" x 10.7"Weight: 19 lbs	380.80	1	\$380.80
HDU-WBT	Hammer Strength	Wall Ball Target	<ul style="list-style-type: none">To be utilized with Wall Balls up to 30 lbsHS Logo marks 10' lineVinyl pre stressed wrapSize (L x W x H): 45" x 16" x 9.5"Weight: 35 lbs	255.85	1	\$255.85
HDU-NG	Hammer Strength	Neutral Grip Handles (Pair) 	<ul style="list-style-type: none">Mounted to any 42" or 72" Square X MemberGrip is 1.25" diameter with ergonomic angles to minimize joint stress on wrists, elbows, and shouldersSize (L x W x H): 16.75" x 8.5" x 3.4"Weight (Pair): 15.8 lbs	216.75	2	\$433.50
FRM-OPT	Life Fitness	Optional Frame Color (per unit)		252.80	4	\$1,011.20








FREE WEIGHTS

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
SD-005-050U	Troy Barbell	8-Sided Urethane Dumbbell Set 5Lb-50lb	<ul style="list-style-type: none">8-Sided Urethane DumbbellContoured Chrome Handles	1,624.97	1	\$1,624.97
SD-055-100U	Troy Barbell	8-Sided Urethane Dumbbell Set 55Lb-100lb	<ul style="list-style-type: none">8-Sided Urethane DumbbellContoured Chrome Handles	4,579.09	1	\$4,579.09
KB-010G2	Troy Barbell	Cast Iron Kettlebell 10lb.	<ul style="list-style-type: none">Black Cast Iron Kettlebell	21.34	2	\$42.68










advanced exercise

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
KB-020G2	Troy Barbell	Cast Iron Kettlebell 20lb.	• Black Cast Iron Kettlebell	42.68	2	\$85.36
						
KB-035G2	Troy Barbell	Cast Iron Kettlebell 35lb.	• Black Cast Iron Kettlebell	74.68	2	\$149.36
						
KB-050G2	Troy Barbell	Cast Iron Kettlebell 50lb.	• Black Cast Iron Kettlebell	106.68	2	\$213.36
						
KB-070G2	Troy Barbell	Cast Iron Kettlebell 70lb.	• Black Cast Iron Kettlebell	149.35	2	\$298.70
						
KB-090G2	Troy Barbell	Cast Iron Kettlebell 90lb.	• Black Cast Iron Kettlebell	192.02	2	\$384.04
						








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Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
GBO-010SBP	Troy Barbell	10 lb Rubber Bumper Plate	<ul style="list-style-type: none">• Solid Rubber Black Bumper Plate with Steel Insert• USA branded	28.08	4	\$112.32
						
GBO-025SBP	Troy Barbell	25 lb Rubber Bumper Plate	<ul style="list-style-type: none">• Solid Rubber Black Bumper Plate with Steel Insert• USA branded	45.23	4	\$180.92
						
GBO-045SBP	Troy Barbell	45 lb Rubber Bumper Plate	<ul style="list-style-type: none">• Solid Rubber Black Bumper Plate with Steel Insert• USA branded	80.50	12	\$966.00
						
GO-002U	Troy Barbell	Urethane Encased Olympic Grip Plate 2.5lb.		20.11	8	\$160.88
						
GO-005U	Troy Barbell	Urethane Encased Olympic Plate 5lb.		27.73	12	\$332.76
						








advanced exercise

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
GO-010U	Troy Barbell	Urethane Encased Olympic Plate 10lb.		45.37	16	\$725.92
						
GO-025U	Troy Barbell	Urethane Encased Olympic Grip Plate 25lb.		91.11	16	\$1,457.76
						
GO-045U	Troy Barbell	Urethane Encased Olympic Grip Plate 45lb.		164.00	16	\$2,624.00
						
TOZ-47	Troy Barbell	47in. Commercial Olympic Curl Bar - Chrome		135.40	1	\$135.40
						
OB-20KG-190CR	UMAX	20kg Oly Bar, Cerakote Red	<ul style="list-style-type: none">• Center Knurling• Needle Bearings• 190,000 psi• 4 Year Warranty	300.00	4	\$1,200.00
						



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Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
AOT-56	Troy Barbell	Olympic Hex Bar (56 in)		274.50	1	\$274.50
						
TOZ-60B	Troy Barbell	5ft. Deluxe Commercial Olympic Curl Bar - Black		252.75	1	\$252.75
						
PR2-RED	Avus Designs	Lock-Jaw Pro2 Barbell Collar (Red)	<ul style="list-style-type: none">• 2" Olympic Barbell Collar• Rubber Protective Lining• Lever and Lock Tab for Secure Lock• For Use with Olympic Lifts	38.00	5	\$190.00
						
VTR-36	Troy Barbell	Triceps Rope	<ul style="list-style-type: none">• Made from heavy duty, polyester fibers• Moisture and fray resistant• 36" long with solid polymer ends	26.29	1	\$26.29
						
40420	Power Systems	Olympic Bar Holder		188.55	1	\$188.55
						
MISC	Advanced Exercise	American Barbell - Safety Squat Bar - SB-SSB-VNYL		537.33	1	\$537.33
MISC	Advanced Exercise	American Barbell - Swiss Bar - SB-FBB		345.71	1	\$345.71



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Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
MISC	Advanced Exercise	American Barbell - Axel Bar - SB-AB		197.14	1	\$197.14



TRAINING TOOLS

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
PWB-006	Troy Barbell	VTX Wall Ball 6lb.		70.24	1	\$70.24



PWB-010	Troy Barbell	VTX Wall Ball 10lb.		73.97	1	\$73.97
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PWB-020	Troy Barbell	VTX Wall Ball 20lb.		98.19	1	\$98.19
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PWB-030	Troy Barbell	VTX Wall Ball 30lb.		116.60	1	\$116.60
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advanced exercise

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
PWB-040	Troy Barbell	VTX Wall Ball 40lb.		148.84	1	\$148.84
						
PWB-050	Troy Barbell	VTX Wall Ball 50lb.		167.24	1	\$167.24
						
GVFR	Troy Barbell	VTX Foam Roller	<ul style="list-style-type: none">• Lightweight and flexible• Weight 1lb• Dimensions 12" (L) x 4.72" (W)	42.42	2	\$84.84
						
GVCT-UH	Troy Barbell	VTX Covered Resistance Tube (Extra Heavy)	<ul style="list-style-type: none">• Color coded resistance bands• Easy soft grip handles•	20.97	2	\$41.94
						
GVCT-H	Troy Barbell	VTX Covered Resistance Tube (Heavy)	<ul style="list-style-type: none">• Color coded resistance bands• Easy soft grip handles•	19.97	2	\$39.94
						








advanced exercise

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
GVCT-M	Troy Barbell	VTX Covered Resistance Tube (Medium) 	<ul style="list-style-type: none">• Color coded resistance bands• Easy soft grip handles•	18.97	2	\$37.94
GVCT-L	Troy Barbell	VTX Covered Resistance Tube (Light) 	<ul style="list-style-type: none">• Color coded resistance bands• Easy soft grip handles•	17.97	2	\$35.94
GVCT-UL	Troy Barbell	VTX Covered Resistance Tube (Extra Light) 	<ul style="list-style-type: none">• Color coded resistance bands• Easy soft grip handles•	15.97	2	\$31.94
TPC	Troy Barbell	Tri Plyo Cube 	<ul style="list-style-type: none">• Vinyl Covered High Density Foam• 20 in X 24 in. X 30 in. Landing Areas	293.25	2	\$586.50
ROPE1-40G	Troy Barbell	40 ft Battle Rope 1.5 inch Diameter 	<ul style="list-style-type: none">• Fray Resistant Material• Vinyl Grips• 17lbs.	144.55	1	\$144.55



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Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
ROPE2-50G	Troy Barbell	50 ft Battle Rope 2 inch Diamter 	<ul style="list-style-type: none">• Fray Resistant Material• Vinyl Grips• 37lbs.	307.38	1	\$307.38
GCB-28S	Troy Barbell	28in. Multi-Purpose Curl Bar with Swivel 		43.75	1	\$43.75
GCT	Troy Barbell	Chinning Triangle 		36.05	1	\$36.05
GTVB	Troy Barbell	Triceps Press Down V Bar 		29.60	1	\$29.60
GSB-20S	Troy Barbell	20in. Multi-Purpose Economy Straight Bar with Swivel 		34.22	1	\$34.22
MISC	Advanced Exercise	Troy - VTX Flat Band Mini Loop - Extra Heavy - GVFBML- XH		5.30	2	\$10.60



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Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
MISC	Advanced Exercise	Troy - VTX Flat Band Mini Loop - Heavy - GVFBMLHVV		4.88	2	\$9.76
MISC	Advanced Exercise	Troy - VTX Flat Band Mini Loop - Medium - GVFBMLMED		4.46	2	\$8.92
MISC	Advanced Exercise	Troy - VTX Flat Band Mini Loop - Light - GVFB-ML-L		4.30	2	\$8.60
MISC	Advanced Exercise	Spud Inc - Dip Belt "The Big Dipper" - SPUD149 BLACK		54.99	1	\$54.99
MISC	Advanced Exercise	PRx - Wall Mounted Battle Rope Storage - PX281		44.29	2	\$88.58
MISC	Advanced Exercise	PRx - Wall Mounted Mobility Band Storage - PXS014		34.14	2	\$68.28
GVSBL-XH	Troy Barbell	VTX Strength Band Loop - Extra Heavy (Black)	<ul style="list-style-type: none">• Continuous Latex Loop• Length 40"	48.77	1	\$48.77
GVSBL-HVY	Troy Barbell	VTX Strength Band Loop - Heavy (Egyptian Blue)	<ul style="list-style-type: none">• Continuous Latex Loop• Length 40"	36.77	1	\$36.77
GVSBL-MED	Troy Barbell	VTX Strength Band Loop - Medium (Spanish Orange)	<ul style="list-style-type: none">• Continuous Latex Loop• Length 40"	29.52	1	\$29.52



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Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
GVSBL-LIT	Troy Barbell	VTX Strength Band Loop - Light (Bitter Lemon)	<ul style="list-style-type: none">Continuous Latex LoopLength 40"	19.40	1	\$19.40



BAY EQUIPMENT

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
MISC	Advanced Exercise	PRx - 3x3 Profile Rack PRO with Multi-Grip Bar (96") - PXP400 - Red		923.06	1	\$923.06
MISC	Advanced Exercise	PRx - 4-peg Plate Storage - PX4951B - Black		160.60	2	\$321.20
MISC	Advanced Exercise	PRx - Plate Storage Weight Wing Extension - PX4952B - Black		73.85	2	\$147.70
MISC	Advanced Exercise	PRx - Single bar wall mounted storage - PXS015		44.29	1	\$44.29
GO-002U	Troy Barbell	Urethane Encased Olympic Grip Plate 2.5lb.		20.11	4	\$80.44







GO-005U	Troy Barbell	Urethane Encased Olympic Plate 5lb.		27.73	4	\$110.92
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advanced exercise

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
GBO-010SBP	Troy Barbell	10 lb Rubber Bumper Plate 	<ul style="list-style-type: none">• Solid Rubber Black Bumper Plate with Steel Insert• USA branded	28.08	4	\$112.32
GBO-025SBP	Troy Barbell	25 lb Rubber Bumper Plate 	<ul style="list-style-type: none">• Solid Rubber Black Bumper Plate with Steel Insert• USA branded	45.23	4	\$180.92
GBO-045SBP	Troy Barbell	45 lb Rubber Bumper Plate 	<ul style="list-style-type: none">• Solid Rubber Black Bumper Plate with Steel Insert• USA branded	80.50	8	\$644.00
OB-20KG-190CR	UMAX	20kg Oly Bar, Cerakote Red 	<ul style="list-style-type: none">• Center Knurling• Needle Bearings• 190,000 psi• 4 Year Warranty	300.00	1	\$300.00



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FACILITY MAINTENANCE

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
MAINTENANCE-NT	Advanced Exercise	1 Year Preventive Maintenance - Bi-Annual Visit (Non-Taxable) - \$780 Value		0.00	1	\$



SERVICES & FEES

Model	Brand	Description	Specifications	Unit Price	Qty	Total Ext
TARIFF	Advanced Exercise	Manufacturer Tariff		0.00	1	\$

Comments:

- Item delivered and fully assembled through certified commercial assembly group per client floorplan.

- All trash and debris clean on site post installation.

- Most items have 12 weeks lead time, axiom items may take up to 20 weeks for red frames.

Subtotal:

\$84,686.45

Freight, Delivery and Install:

14,320.00

Total:

Taxes As Applicable
\$99,006.45



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Terms & Conditions

Terms: All new customers are required to pay 50% down and balance due prior to install. Residential customers, personal trainers, and orders for resale, require 100% payment before the order can be placed. All other terms and credit lines are subject to credit approval. Invoice will be due and payable, based on the original requested installation date, unless Advanced Exercise is notified in writing 60 days prior to the requested installation date with a change of the installation date. We accept checks, money orders, ACH and credit cards (under \$2000). A late payment fee will be assessed at a rate of 1.5% (18% annual) per month on any unpaid balance remaining 30 days after the due date. Special Orders: A 100% prepayment is required for all customized products including but not limited to custom colors, sports flooring and products with logos such as plates, dumbbells and platforms.

Return Policy: Any returns require approval in writing by Advanced Exercise Project Management. A minimum 25% restocking fee, plus freight, will be incurred for all non-custom products returned. Customized products are nonreturnable. All products with color choices are defined as custom products.

Bolt Down Requirements: Life Fitness recommends that all strength training equipment be secured to the floor in order to prevent tipping, rocking or displacement which might occur in the event of unanticipated use of the equipment. Life Fitness requires that certain strength training equipment (specifically the Synrgy 360 90, T, XS, XM, HD Elite Half Rack/Short Base, Athletic Series Rigs, Athletic Series Racks with Wing option, Cybex PWR Play, Synrgy Outdoor BlueSky and other products to be used for body weight strap training) be secured to the floor. In the case of Synrgy 360S, T, XS, XM and the Elite HD Half Rack Short Base, the customer acknowledges:

- Customer has determined the proper placement of the equipment to be secured. **Customer Initial** _____
- Customer has identified and informed Advanced Exercise of the location of any utility, service lines, including but not limited to post tension cables. It is the customer's responsibility to identify the locations of any cables or lines prior to installation.

Customer Initial _____

- Customer has confirmed that the subfloor consists of no less than 4.0 inches of concrete. **Customer Initial** _____
- Customer has obtained any and all consents to the drilling of holes in the flooring and subflooring. **Customer Initial** _____

If your order includes any of the equipment requiring bolting to the floor, initials are required above and an additional signed waiver will be required to place the order. Additional products may require bolting to the floor, wall or ceiling. Bolting is not included on these products unless otherwise noted on the quotation. Customer is responsible for bolting these products to meet the manufacturer's requirements. This includes TRX, Core Energy, Boxing mounts and other products that require bolting to the facility structure.

Wall & Ceiling Attached Items: The installation of any items such as TRX Multi Mounts., X Mounts, Wall Mat Racks, etc. that require bolting to walls or ceilings are not included in the proposal unless otherwise noted.

Flooring Installation: Refer to the product specifications to ensure that the sub floor meets the material installation requirements. Freight offloading, inside delivery, adhesive, moisture tests, moisture reducers, base boards, sub floor prep, sub floor cleaning, transition strips and existing floor removal and disposal are not included unless otherwise noted on the quotation.

Storage: We reserve the right to assess storage fees not to exceed 1.5% per month, or fraction thereof and request payment in full on the related customer's invoice, when a customer's original requested delivery date is delayed by circumstances beyond our control.

Taxes: We collect sales or use taxes only in jurisdictions where we are licensed to do so. Customer agrees to accept sole liability and responsibility to pay for any and all uncollected sales or use tax liabilities, related penalties and interest that arise as a result of the purchase of products and/or services from our company.

Security: Until all products are paid in full, customer hereby grants to, and Advanced Exercise shall retain, a security interest in and lien on all products sold to the customer.

I accept the terms and conditions of this quote.

Signature: _____

Name: _____

Date: _____ **Customer Requested Install Date:** _____

Appendix “D”

INFORMATION TECHNOLOGY EQUIPMENT FOR FIRE STATION

**CONTRACTOR SHALL PURCHASE AND TURN OVER TO OWNER ALL
I.T. EQUIPMENT SHOWN HEREIN - NO SUBSTITUTIONS ALLOWED**



9300 Santa Anita Avenue
Suite 102
Rancho Cucamonga, CA 91730

Quote

Date	Quote #
1/28/2026	11981

Bill To
City of Perris 101 North 'D' Street Perris, CA 92570-1998

Ship To
City of Perris 101 North 'D' Street Perris, CA 92570-1917

Rep	Project
KW	

Qty	Item	Description	Cost	Total
		<ul style="list-style-type: none"> - PowerEdge R660xs Motherboard with Broadcom 5720 Dual Port 1Gb On-Board LOM, MX, MLK - Dell Connectivity Client - Enabled - iDRAC9, Enterprise 16G - Broadcom 57416 Dual Port 10GbE BASE-T Adapter, OCP NIC 3.0 - Broadcom 5719 Quad Port 1GbE BASE-T Adapter, PCIe Low Profile - Standard Bezel for x8 and x10 chassis - BOSS-N1 controller card + with 2 M.2 480GB - (RAID 1) - No Quick Sync - iDRAC, Legacy Password - iDRAC Group Manager, Disabled - Windows Server 2025 Standard, 16CORE, FI, No Med, No CAL, Multi Language - Windows Server 2025 Standard, 16CORE, DF Recovery Image, Multi Lang, (Downgrade not included) - Dell Secure Onboarding Client Disabled - ReadyRails A11 drop-in/stab-in Slide Combo Rails Without Cable Management Arm - PowerEdge R660xs Shipping - PowerEdge R660xs, 8x2.5, Short Drive Shipping Material - PowerEdge R660xs, HS5610 Label, CCC Marking, No CE Marking, for below 1300W PSU - Basic Next Business Day 36 Months, 36 Month(s) - NO WARRANTY UPGRADE SELECTED, 36 Month(s) - No Field Deployment Customer Install Required 		
Total				

Hardware pricing and availability are subject to change due to market conditions. We will keep you informed and offer alternatives if applicable



9300 Santa Anita Avenue
Suite 102
Rancho Cucamonga, CA 91730

Quote

Date	Quote #
1/28/2026	11981

Bill To
City of Perris 101 North 'D' Street Perris, CA 92570-1998

Ship To
City of Perris 101 North 'D' Street Perris, CA 92570-1917

				Rep	Project
				KW	
Qty	Item	Description	Cost	Total	
2	Dell-R660xs	OPP-1744 - COP - 2 New Dell Servers for Fire Station PowerEdge R660xs Smart Selection (210-BFUZ) Description: - PowerEdge R660xs - Trusted Platform Module 2.0 V6 - 2.5" Chassis with up to 8 Hard Drives (SAS/SATA), 1 CPU, PERC 11 - Intel® Xeon® Gold 5416S 2G, 16C/32T, 16GT/s, 30M Cache, Turbo, HT (150W) DDR5-4400 - No Additional Processor - Heatsink for 1 CPU configuration (CPU less than or equal to 150W) - Performance Optimized - 5600MT/s RDIMMs - (2) 32GB RDIMM, 5600MT/s, Dual Rank - C7, Unconfigured RAID for HDDs or SSDs (Mixed Drive Types Allowed) - Front PERC H755 Front Load - (8) 3.84TB SSD SATA Read Intensive 6Gbps 512e 2.5in Hot-plug AG Drive, 1 DWPD - Power Saving Dell Active Power Controller - UEFI BIOS Boot Mode with GPT Partition - No Energy Star - Standard Fan X5 - Dual, (1+1) Fully Redundant, Hot-Plug Power Supply, 800W MM (100-240Vac) - (2) NEMA 5-15P to C13 Wall Plug, 125 Volt, 15 AMP, 10 Feet (3m), Power Cord, North America - Riser Config 3, Low Profile, 1x16 LP Slots (Gen4)	36,137.96	72,275.92T	
			Total		

Hardware pricing and availability are subject to change due to market conditions. We will keep you informed and offer alternatives if applicable

Quote

Date	Quote #
1/28/2026	11981

Bill To
City of Perris 101 North 'D' Street Perris, CA 92570-1998

Ship To
City of Perris 101 North 'D' Street Perris, CA 92570-1917

Rep	Project
KW	

Qty	Item	Description	Cost	Total
1	Freight	Shipping TBD Sales Tax	0.00 8.75%	0.00 6,324.14
Total				\$78,600.06

Hardware pricing and availability are subject to change due to market conditions. We will keep you informed and offer alternatives if applicable

Syntech Group

9300 Santa Anita Avenue
Suite 102
Rancho Cucamonga, CA
91730
Phone - 888-520-1787

**Invoice**

Date	Invoice #
1/22/2026	A24740

Bill To
City of Perris 101 North 'D' Street Perris, CA 92570-1998

Ship To
City of Perris 101 North 'D' Street Perris, CA 92570-1917

P.O. Number	Terms	Rep	Due Date
011626 - NGallegos	Net 30	KW	2/21/2026

Quantity	P/N	Description	Price Each	Item Code	Amount
1	FG-60F-BDL-950-36	OPP-1715 - COP - New FortiGate 60F Fortinet FortiGate 60F - security appliance - with 3 years 2Fortinet FortiGate 60F - security appliance - with 3 years 24x7 FortiCare & FortiGuard Unified (UTM) Protectionx7 FortiCare & FortiGuard Unified (UTM) Protection SN: FGT60FTK2209E2ZS Shipping Tracking NO:501611594480 Sales Tax	1,529.52	FG-60F-BDL-95...	1,529.52T
1			26.00	Freight	26.00
			8.75%		133.83

WWW.SYNTECHGROUP.COM
888-520-1787
info@syntechgroup.com

Total \$1,689.35
Payments/Credits \$0.00
Balance Due \$1,689.35

Please note: Starting June 1, 2021 A late fee of 1.5% will be added to unpaid balances each month

Syntech Group

9300 Santa Anita Avenue
Suite 102
Rancho Cucamonga, CA
91730
Phone - 888-520-1787

**Invoice**

Date	Invoice #
1/14/2026	A24714

Bill To
City of Perris 101 North 'D' Street Perris, CA 92570-1998

Ship To
City of Perris 101 North 'D' Street Perris, CA 92570-1917

P.O. Number	Terms	Rep	Due Date
010626 - NGallegos	Net 30	KW	2/13/2026

Quantity	P/N	Description	Price Each	Item Code	Amount
2	EX4100-48P	OPP-1708 - COP - Juniper Switches Juniper EX4100-48P Ethernet Switch SER NBR: SFA3925AX0059, SFA3925AX0161	4,159.59	EX4100-48P	8,319.18T
2	SUB-EX48-2 S-1Y-N	1 Year Wired Assurance and Virtual Network Assistant (VNA) Subscription for EX48 port switches; Includes Juniper Care Next Day Support for EX2300, EX4100-F, EX3400, EX4100, EX4300, EX4400 24 ports switches.	465.88	SUB-EX48-2S-...	931.76
1		Shipping	56.00	Freight	56.00
		Sales Tax	8.75%		727.93

WWW.SYNTECHGROUP.COM
888-520-1787
info@syntechgroup.com

Total \$10,034.87
Payments/Credits \$0.00
Balance Due \$10,034.87

Please note: Starting June 1, 2021 A late fee of 1.5% will be added to unpaid balances each month

Appendix “E”

INFORMATION TECHNOLOGY EQUIPMENT FOR ADMIN. BUILDING

(ADDITIVE ALTERNATE #1)

CONTRACTOR SHALL PURCHASE AND TURN OVER TO OWNER ALL
I.T. EQUIPMENT SHOWN HEREIN - NO SUBSTITUTIONS ALLOWED

Quote

Date	Quote #
12/19/2025	11948

Bill To
City of Perris 101 North 'D' Street Perris, CA 92570-1998

Ship To
City of Perris 101 North 'D' Street Perris, CA 92570-1917

				Rep	Project
				KW	
Qty	Item	Description	Cost	Total	
2	EX4100-48P	OPP-1708 - COP - Juniper Switches	4,159.59	8,319.18T	
2	SUB-EX48-2S-1...	Juniper EX4100-48P Ethernet Switch	465.88	931.76	
		1 Year Wired Assurance and Virtual Network Assistant (VNA) Subscription for EX48 port switches; Includes Juniper Care Next Day Support for EX2300, EX4100-F, EX3400, EX4100, EX4300, EX4400 24 ports switches.			
1	Freight	Shipping TBD	0.00	0.00	
		Sales Tax	8.75%	727.93	
			Total	\$9,978.87	

Hardware pricing and availability are subject to change due to market conditions. We will keep you informed and offer alternatives if applicable

Quote

Date	Quote #
12/19/2025	11950

Bill To
City of Perris 101 North 'D' Street Perris, CA 92570-1998

Ship To
City of Perris 101 North 'D' Street Perris, CA 92570-1917

				Rep	Project
				KW	
Qty	Item	Description	Cost	Total	
2	AP63E-US	OPP-1708 - COP - Juniper APs Juniper AP63E Dual Band Wi-Fi 6 IEEE 802.11ax 3.50 Gbit/s Wireless Access Point - Outdoor	1,721.41	3,442.82T	
2	SUB-2S-1Y	I Year Mist Subscription WIFI Assurance Subscription Virtual Network Assistant Subscription	260.41	520.82	
2	ATS-01112	AccelTex Solutions antenna - 6 element, with N-style	422.58	845.16T	
3	AP34-US	Superior Performance MultiGigabit WiFi 6E Access Point (2x2:2) with BLE, with built-in InternalAntenna – US only; Universal Mounting Bracket is included;	879.13	2,637.39T	
3	SUB-2S-1Y	I Year Mist Subscription WIFI Assurance Subscription Virtual Network Assistant Subscription	260.40	781.20	
1	Freight	Shipping TBD	0.00	0.00	
		Sales Tax	8.75%	605.97	
			Total	\$8,833.36	

Hardware pricing and availability are subject to change due to market conditions. We will keep you informed and offer alternatives if applicable