

TECHNICAL SPECIFICATIONS

FOR

**ALTERATION TO STUDENT SERVICES ANNEX (A#33484)
NEXT-UP FOSTER YOUTH SERVICES**

**VENTURA COUNTY COMMUNITY COLLEGE DISTRICT
Bid No.**

FOR

**MOORPARK COLLEGE
7075 CAMPUS ROAD
MOORPARK, CA 93021**



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AMADOR WHITTLE ARCHITECTS, INC



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ORION STRUCTURAL ENGINEERS



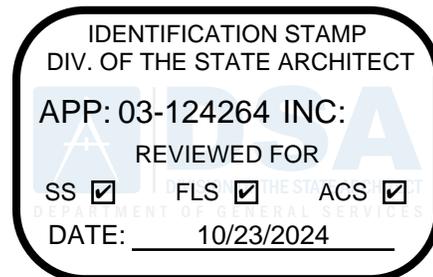
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07 2100	Thermal Insulation.....	05
07 2600	Vapor Barriers.....	04
07 2719	Plastic Sheet Air Barriers.....	05
07 6000	Flashing and Sheet Metal.....	04
07 9200	Joint Sealants.....	06

DIVISION 8 - OPENINGS

08 1113	Hollow Metal Doors and Frames.....	13
08 1416	Flush Wood Doors.....	07
08 3116	Access Panels and Frames.....	03
08 7100	Door Hardware.....	14

DIVISION 9 - FINISHES

09 0561	Moisture Testing for Flooring Installation.....	06
09 2216	Non-Structural Metal Framing.....	09
09 2900	Gypsum Board.....	11
09 5113	Acoustical Panel Ceilings.....	08
09 6513	Rubber Base.....	04
09 6523	Luxury Vinyl Tile.....	06
09 6813	Tile Carpeting.....	10
09 9000	Painting and Coating.....	09
09 9643	Epoxy Floor Coating.....	03

DIVISION 10 - SPECIALTIES

10 1400	Signage.....	12
10 2113	Plastic Toilet Compartments.....	06
10 2813	Toilet Accessories.....	04
10 4413	Fire Extinguishers Cabinets.....	04

DIVISION 11 – EQUIPMENT– NOT USED

DIVISION 12 - FURNISHINGS

12 2113	Window Blinds.....	03
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DIVISION 13 – SPECIAL CONSTRUCTION – NOT USED

DIVISION 14 - CONVEYING SYSTEMSM – NOT USED

DIVISION 21 – FIRE SUPRESSION – NOT USED

DIVISION 22 – PLUMBING

07 2100	Thermal Insulation.....	05
07 2600	Vapor Barriers.....	04
07 2719	Plastic Sheet Air Barriers.....	05
07 6000	Flashing and Sheet Metal.....	04
07 9200	Joint Sealants.....	06

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08 1113	Hollow Metal Doors and Frames.....	13
08 1416	Flush Wood Doors.....	07
08 3116	Access Panels and Frames.....	03
08 7100	Door Hardware.....	16

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09 0561	Moisture Testing for Flooring Installation.....	06
09 2216	Non-Structural Metal Framing.....	09
09 2900	Gypsum Board.....	11
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DIVISION 14 - CONVEYING SYSTEMSM – NOT USED

DIVISION 21 – FIRE SUPRESSION – NOT USED

DIVISION 22 – PLUMBING

22 0500	Common Work Results for Plumbing.....	05
22 0510	Plumbing Piping.....	09
22 0523	General Duty Valves for Plumbing Piping.....	05
22 0529	Hangers and Supports for Plumbing Piping and Equipment.....	07
22 4000	Plumbing Fixtures and Equipment.....	09

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING

23 0500	Common Work results for HVAC.....	08
23 0529	Hangers and Supports for HVAC Piping and Equipment.....	06
23 0593	Testing, Adjusting, and Balancing for HVAC.....	16
23 0700	HVAC Insulation.....	06
23 3113	Metal Ducts.....	09
23 3300	Air Duct Accessories.....	08
23 3416	HVAC Fans and Exhaust Systems.....	03
23 3713	Diffusers, Registers & Grilles.....	02

DIVISION 26 – ELECTRICAL

26 0000	General Provisions.....	10
26 0050	Basic Electrical Materials & Methods.....	05
26 0060	Minor Electrical Demolition for Remodeling.....	03
26 0111	Conduits.....	05
26 0120	Conductors.....	04
26 0130	Electrical Boxes.....	04
26 0140	Wiring Devices.....	09
26 0142	Nameplates and Warning Signs.....	02
26 0164	Branch Circuit Panel Boards.....	02
26 0190	Support Devices.....	02
26 2450	Grounding.....	06
26 2510	Lighting Fixtures New.....	03
26 4721	Fire Alarm System New.....	32
26 4745	Networking and Data Communications.....	15
26 4901	General Control Devices.....	03

DIVISION 31 – EARTHWORK

31 1000	Site Clearing.....	03
31 2000	Earthwork.....	06

DIVISION 32 – SITE WORK

32 1123	Aggregate Base Courses.....	02
32 1216	Asphalt Concrete Paving.....	04
32 1600	Curbs, Gutters, Sidewalks.....	04

32 1723 Pavement Markings05

DIVISION 33 – UNDERGROUND UTILITIES

33 4000 Storm Drainage Utilities04

END OF TABLE OF CONTENTS

SECTION 01 1100
SUMMARY OF WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The furnishing of all labor, materials, equipment, services, and incidentals necessary for Work of the **STUDENT SERVICES ANNEX – NEXT-UP FOSTER PROGRAM** at **MOORPARK COLLEGE** located at **7075 Campus Road, Moorpark, California 93021**, as set forth in the Construction Documents which include, but are not limited to, the Drawings, Addenda and Specifications.

1.02 RELATED REQUIREMENTS:

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 USE OF PREMISES

- A. CONTRACTOR shall coordinate Work of all trades, Subcontractors, utility service providers, with OWNER and/or Separate Work Contract. CONTRACTOR shall sequence, coordinate, and perform the Work to impose minimum hardship on the operation and use of the existing facilities and/or Project site. CONTRACTOR shall install all necessary protection for existing improvements, Project site, property, and new Work against dust, dirt, weather, damage, vandalism, and maintain and relocate all protection to accommodate progression of the Work.
- B. CONTRACTOR shall confine entrance and exiting to the Project site and/or facilities to routes designated by the OWNER.
- C. Within existing facilities, OWNER will remove portable equipment, furniture, and supplies from Work areas prior to the start of Work. CONTRACTOR shall cover and protect remaining items in areas of the Work.
- D. CONTRACTOR is advised school may be in session during performance of the Work. CONTRACTOR shall utilize all available means to prevent generation of unnecessary noise and maintain noise levels to a minimum. When required by the OWNER, CONTRACTOR shall immediately discontinue noise-generating activities and/or provide alternative methods to minimize noise generation. CONTRACTOR shall

install and maintain air compressors, tractors, cranes, hoists, vehicles, and other internal combustion engine equipment with mufflers, including unloading cycle of compressors. CONTRACTOR shall discontinue operation of equipment producing objectionable noise as required by the OWNER.

- E. CONTRACTOR shall furnish, install, and maintain adequate supports, shoring, and bracing to preserve structural integrity and prevent collapse of existing improvements and/or Work modified and/or altered as part of the Work.
- F. CONTRACTOR shall secure building entrances, exits, and Work areas with locking devices as required by the OWNER.
- G. CONTRACTOR assumes custody and control of OWNER property, both fixed and portable, remaining in existing facilities vacated during the Work.
- H. CONTRACTOR shall cover and protect surfaces of rooms and spaces in existing facilities turned over for the Work, including OWNER property remaining within as required to prevent soiling or damage from dust, dirt, water, and/or fumes. CONTRACTOR shall protect areas adjacent to the Work in a similar manner. Prior to OWNER occupancy, CONTRACTOR shall clean all surfaces including OWNER property.
- I. CONTRACTOR shall not use or allow anyone other than OWNER employees to use facility telephones and/or other equipment, except in an emergency. CONTRACTOR shall reimburse OWNER for telephone toll charges originating from the facility except those arising from emergencies or use by OWNER employees.
- J. CONTRACTOR shall protect all surfaces, coverings, materials, and finished Work from damage. Mobile equipment shall be provided with pneumatic tires.
- K. CONTRACTOR is advised OWNER may award Separate Work Contracts at this Project site.
- L. CONTRACTOR shall not permit the use of portable and/or fixed radio's or other types of sound producing devices including walkmans and similar devices.

3.02 PROPERTY INVENTORY

- A. Property, OWNER intends to remove; will be removed by OWNER before a room or space is vacated for the Work. Before performing Work in each room or space, OWNER and CONTRACTOR shall prepare a detailed initial written inventory of OWNER property remaining within, including equipment and telephone instruments and the condition thereof. OWNER and CONTRACTOR shall retain a signed copy of the inventory dated and signed by both parties. Prior to subsequent OWNER

occupancy of each such room or space, OWNER and CONTRACTOR shall perform a final inventory of OWNER property and all discrepancies between the initial inventory and final inventory shall be the responsibility of CONTRACTOR.

3.03 FURNITURE, FIXTURES AND EQUIPMENT (MATERIALS) OWNER FURNISHED CONTRACTOR INSTALLED (OFCI)

- A. Certain materials identified in the Contract Documents as OWNER Furnished CONTRACTOR Installed, OFCI, will be delivered to the Project site by the OWNER.
- B. If designated in the Contract Documents to be OWNER furnished CONTRACTOR installed, (OFCI), CONTRACTOR shall unload, store, uncrate, assemble, install, and connect OWNER supplied materials.
- C. Sixty days before the date the CONTRACTOR needs to have the OFCI materials on site, CONTRACTOR shall notify OWNER of the scheduled date for needed OFCI materials. Upon delivery to Project site, CONTRACTOR shall store OFCI materials inside rooms and/or protected spaces and will be responsible for security of OFCI materials until Substantial Completion. OWNER will sign receipt or bill of lading as applicable.
- D. CONTRACTOR shall, within ten days after delivery, uncrate and/or unpack OFCI materials in presence of OWNER who shall inspect delivered items. OWNER shall prepare an inspection report listing damaged or missing parts and accessories. OWNER shall transmit one copy of the report to CONTRACTOR. OWNER will procure and/or replace missing and or damaged OFCI materials, as indicated in inspection report.
- E. CONTRACTOR shall install OFCI materials in the locations and orientation as indicated in the Contract Documents. CONTRACTOR shall verify exact locations with OAR before final installation of OFCI materials.
- F. If required, ONWER will furnish setting and or placement drawings for OFCI materials.
- G. CONTRACTOR shall install OFCI materials by proper means and methods to ensure an installation as recommended by the manufacturer. CONTRACTOR shall furnish and install all necessary fasteners and required blocking to properly install OFCI materials.
- H. CONTRACTOR shall install OFCI materials with manufacturer recommended fasteners for the type of construction to which the OFCI materials are being fastened and/or anchored.

- I. CONTRACTOR shall provide final connections of any electrical, signal, gas, water, waste, venting and/or similar items to OFCI materials. CONTRACTOR shall, prior to final connection, verify the operating characteristics of OFCI materials are consistent with the designated supply.
- 3.04 FURNITURE, FIXTURES AND EQUIPMENT (Materials) - OWNER furnished, OWNER installed (OFOI)
- A. Certain materials are identified in the Contract Documents as OWNER Furnished, OWNER Installed (OFOI)
- B. On dates and during times designated by OWNER, CONTRACTOR shall provide clear off-loading, receiving, protected storage, and OWNER'S dumpster space areas for the use of OWNER or OWNER'S third party OFOI installation contractors. At such times, CONTRACTOR shall also make clear routes and access available to all rooms and spaces to receive OFOI materials.
- C. On dates and during times designated by OWNER, CONTRACTOR shall provide access to the elevators for use of OWNER or OWNER'S third party OFOI installation contractors.
- D. CONTRACTOR shall cooperate fully with OWNER or OWNER'S third part OFOI installation contractors.
- E. CONTRACTOR may be requested by OWNER to provide supplemental labor and equipment to support OFOI activities. Such requests must be submitted in accordance with the change order clauses of Contract.
- F. Immediately prior to mobilization of OWNER or OWNER'S third party OFOI installation contractors, OWNER shall document the condition of the Work in areas to be utilized for OFOI activities.
- G. CONTRACTOR shall not be responsible for damage caused by OWNER or OWNER'S forces. OWNER shall document the condition of the Work and report to CONTRACTOR any damage in areas utilized for OFOI activities.

END OF SECTION

SECTION 01 3113

PROJECT COORDINATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies administrative and procedural requirements necessary for coordinating Work operations including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.

1.02. RELATED REQUIREMENTS

- A. Section 01 3300: Submittal Procedures.
- B. Section 01 4523: Test and Inspection.
- C. Section 01 7700: Contract Closeout.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 COORDINATION

- A. CONTRACTOR shall coordinate operations included in various sections of Contract Documents to assure efficient and orderly installation of each part of Work. Coordinate Work operations included under related sections of Contract Documents that depend on each other for proper installation, connection, and operation of Work, including but not limited to:
 - 1. Schedule construction operations in sequence required where installation of one part of Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
 - 3. Provide provisions to accommodate items scheduled for later installation.

4. Prepare and administer provisions for coordination drawings.
- B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required in notices, reports, attendance at meetings, and:
1. Prepare similar memoranda for OWNER and Separate Work Contract where coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of Work. Such administrative activities include, but are not limited to, following:
1. Preparation of schedules.
 2. Installation, relocation, and removal of temporary facilities.
 3. Delivery and processing of submittals.
 4. Progress meetings.
 5. Project closeout activities.
- D. Conservation: Coordinate Work operations to assure operations are carried out with consideration given to conservation of energy, water, materials, and:
1. Salvage materials and equipment involved in performance of, but not actually incorporated into Work.

3.02 SUBMITTALS

- A. Coordination Drawings: CONTRACTOR shall prepare coordination drawings to coordinate the installation of products and materials fabricated, furnished and installed by separate entities, under different parts of the Contract. CONTRACTOR shall notify OAR and ARCHITECT of all major conflicts in writing in a timely manner so that the design team can respond without construction delays. Coordination drawings shall address the following at a minimum:
1. Limitations in available space for installation or service. CONTRACTOR shall overlay plans of each trade and verify space requirements and conflicts between trades. Minor changes and adjustments that do not affect design intent shall be made by CONTRACTOR and shall be highlighted for ARCHITECT'S review.

2. Incompatibility between items provided under different trades (such as difference in voltage between equipment specified under Divisions 22 and 23 and electrical power provided under Division 26.)
 3. Inconsistencies between drawings, specifications and codes (between trades and within each trade).
 4. Additional items required for existing facilities construction projects shall be designed and prepared from available as-built drawings that are verified through non-invasive and non-destructive, visual observation only. CONTRACTOR shall field verify actual existing conditions during and upon completion of demolition work and incorporate findings into preparation of co-ordination drawings. Minor changes and adjustments that do not affect design intent shall be made by Sub-Contractor and shall be highlighted for OAR and ARCHITECT'S reviews.
- B. Prepare coordination drawings in CAD with each trade on a separate layer, in specified color and scale. CONTRACTOR and each Subcontractor shall provide and forward reproducible copies and CAD drawing files in the order described here:
1. Structural shop drawings shall indicate location and sizes of columns, beams and other structural members, as well as wall, roof and slab penetrations, and will be provided to mechanical, electrical, low voltage and plumbing Sub-contractors for co-ordination. Structural items shall be indicated using black lines.
 2. HVAC Subcontractor will indicate all ductwork, piping and equipment complete with installation and dimensioned service clearances, duct and pipe sizes, fitting types and sizes, top or bottom of duct and pipe elevations, distances of ducts, pipes and equipment from building reference points and hanger and support locations. Minor changes and adjustments that do not affect design intent shall be made by Subcontractor and shall be highlighted for OAR and ARCHITECT'S reviews. Forward drawings to plumbing Subcontractor for further co-ordination. HVAC items shall be indicated using orange lines.
 3. Plumbing Subcontractor will indicate all plumbing lines, and equipment complete with installation and dimensioned service clearances, pipe sizes, fitting types and sizes, top or bottom of pipe elevations, distances of pipes and equipment from building reference points and hanger/support locations Co-ordinate with HVAC Subcontractor. Minor changes and adjustments that do not affect design intent shall be made by Sub-contractor and shall be highlighted for OAR and ARCHITECT'S reviews

Upon completion drawings shall be forwarded to Fire Sprinkler Subcontractor for further co-ordination. All Plumbing items shall be indicated using blue lines.

4. Fire sprinkler Subcontractor will indicate fire sprinkler piping and equipment complete with installation and dimensioned service clearances, pipe sizes, fitting types and sizes, top or bottom of pipe elevations, distances of pipes and equipment from building reference points and hanger or support locations. Co-ordinate with Plumbing and HVAC Subcontractors. Minor changes and adjustments that do not affect design intent shall be made by sub-contractors and shall be highlighted for OAR and ARCHITECT'S reviews. Upon completion drawings shall be forwarded to Electrical CONTRACTOR for further co-ordination. Fire sprinkler equipment shall be indicated using red lines.
5. Electrical and Low Voltage Subcontractors will indicate service and feeder conduit runs and other electrical equipment complete, including low voltage with installation and dimensioned service clearances, sizes, top or bottom of conduit and rack elevations, distances of conduits and equipment from building reference points and hanger and support locations. Co-ordinate with Fire Sprinkler, Plumbing and HVAC Subcontractors. Minor changes and adjustments that do not affect design intent shall be made by sub-contractors and shall be highlighted for OAR and ARCHITECT'S reviews. Upon completion drawings shall be forwarded to CONTRACTOR for further co-ordination. Electrical work shall be indicated in dark green lines. Low voltage work shall be indicated in light green lines.
6. CONTRACTOR will be responsible for the overall coordination review. As each coordination drawing is completed, CONTRACTOR will meet with OAR to review and resolve all conflicts on coordination drawings.
7. Coordination meetings will be held in Project field office of CONTRACTOR. CONTRACTOR is required to distribute Shop Drawings, cut sheets and submittals to Subcontractors where appropriate. Reviewed coordination drawings will be maintained in Project field office of CONTRACTOR. Meeting minutes shall be developed by CONTRACTOR and submitted to OAR within 5 days.

END OF SECTION

SECTION 01 3300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. Section 01 3113: Project Coordination.
- B. Section 01 7329: Cutting and Patching.
- C. Section 01 7700: Contract Closeout.

PART 2 – PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 PROCEDURES

- A. CONTRACTOR is required to review and approve every submittal and shop drawing prior to transmittal and delivery to ARCHITECT. Should CONTRACTOR determine a submittal contains errors, or does not meet the requirements of the contract, CONTRACTOR shall immediately return the submittals and shop drawings to the producer and expedite the corrections prior to transmitting the submittal to ARCHITECT. Submittals shall not be used by CONTRACTOR to request clarifications or submit questions. CONTRACTOR will affix stamp to each submittal certifying CONTRACTOR has performed, at minimum, the following:

1. Verified the submittal is complete in all respects and follows the requirements of the Contract Documents without variance.
 2. Confirmed that no substitutions have been included. If substitutions are included, CONTRACTOR shall eliminate them from the submittal and process them in accordance with Section 00 7000 General Conditions Article 6.14.
 3. Identified any variances from the requirements of the Contract Documents and confirmed that the identified variance meets, but does not exceed the allowable limitations or tolerances as defined in these specifications.
 4. Verified that all submitted materials, dimensions and tolerances are compatible with existing or planned conditions of the Work in order to erect, fabricate, or install the submitted assembly in conformance with the requirements of the Contract Documents.
 5. Coordinated and verified that the dimensions match CONTRACTOR measured field or installation conditions.
 6. Coordinated and verified that the products of separate manufacturers required within any field produced assembly are compatible in all respects for such assembly.
 7. Packaged together all related submittals or shop drawings where such is necessary for a comprehensive ARCHITECT review.
- B. CONTRACTOR shall package each submittal appropriately for transmittal and handling. Transmittal format shall be as required by OWNER. CONTRACTOR shall transmit one PDF format set of each submittal or re-submittal to ARCHITECT, which shall be returned to CONTRACTOR. CONTRACTOR shall provide the OWNER additional copies as specified or as requested by OWNER. ARCHITECT will not accept submittals received from sources other than from CONTRACTOR.
- C. After ARCHITECT'S review, ARCHITECT will transmit submittals to OWNER, CONTRACTOR, INSPECTOR and others as required. Work shall not commence, unless otherwise approved by OWNER, until approved submittals are transmitted to CONTRACTOR.
- D. CONTRACTOR shall clearly identify any deviations from the Contract Documents on each submittal. Any deviation not so noted even though stamped reviewed is not acceptable.

- E. CONTRACTOR shall coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities requiring sequential activity.
- F. Timing of Submittals:
1. In accordance with General Conditions, CONTRACTOR shall submit to ARCHITECT, with copy of transmittal to the OWNER, those Shop Drawings, Product Data, diagrams, materials lists, Samples and other submittals required by the Contract Documents.
 2. The scheduling of submittals shall be sequenced to support the progress of the Work, and shall be:
 - a. Submitted sufficiently in advance of construction, fabrication or installation in order to allow time for transmittal, review, modification, correction, (and resubmission and re-review when required.)
 - b. Phased with adequate time between submittals in order to allow for proper review by the ARCHITECT without negative impact to the Milestones Schedule.
 3. CONTRACTOR shall coordinate submittal of related items and ARCHITECT reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received by ARCHITECT.
 4. CONTRACTOR shall revise, update and submit submittal schedule to ARCHITECT and OWNER on the first of each month, or as required by OWNER.
 5. CONTRACTOR shall allow in the Construction Schedule, at least sixteen days for ARCHITECT review following ARCHITECT receipt of submittal. For mechanical, plumbing, electrical, low voltage, fire sprinklers, door and hardware, and other submittals requiring joint review with OAR, CONTRACTOR shall allow a minimum of eighteen days following ARCHITECT receipt of submittal.
 6. No adjustments to the Contract Time or Milestones will be authorized because of a failure to transmit submittals to ARCHITECT sufficiently in advance of the Work to permit review and processing or where CONTRACTOR fails to provide ARCHITECT submittals on related items.

7. In case of product substitution, Shop Drawing preparation shall not commence until such time as OWNER accepts or rejects the proposed substitution in accordance with the procedures described in the General Conditions.
- G. If required, resubmit submittals in a timely manner. Resubmit as specified for initial submittal but identify as such. Review times for re-submitted items shall be as per the time frames for initial submittal review.
- H. Shop Drawing preparation shall not commence until such time as CONTRACTOR receives Product Data acceptance.
- I. ARCHITECT will stamp each submittal with a uniform, action stamp. ARCHITECT will mark the stamp appropriately to indicate the action taken, as follows:
 1. Final Unrestricted Release: When ARCHITECT marks a submittal “Reviewed” the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
 2. Final-But-Restricted Release: When ARCHITECT, or authorized agent, marks a submittal “Reviewed as Noted,” the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.
 3. Returned for Re-submittal: When ARCHITECT, or authorized agent, marks a submittal “Rejected, Revise and Resubmit,” do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat as necessary to obtain different action mark. In case of multiple submittals covering same items of Work, CONTRACTOR is responsible for any time delays, schedule disruptions, out of sequence Work, or additional costs due to multiple submissions of the same submittal item. Do not use, or allow others to use, submittals marked “Rejected, Revise and Resubmit” at the Project site or elsewhere where Work is in progress.
 4. Other Action: Where a submittal is for information or record purposes or special processing or other activity, ARCHITECT, or authorized agent, will return the submittal marked “Action Not Required “.

3.02 SHOP DRAWINGS

- A. Shop Drawings are original drawings prepared by CONTRACTOR, Sub-contractor, supplier, or distributor illustrating some portion of Work by showing fabrication, layout, setting, or erection and shall not be based on reproduced Contract Documents or copied standard information.
- B. Produce Shop Drawings to an accurate scale that is large enough to indicate all pertinent features and methods. Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.
- C. Shop Drawings shall include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:
 - 1. Dimensions.
 - 2. Identification of products and materials included by sheet and detail number.
 - 3. Compliance with specified standards.
 - 4. Notation of coordination requirements.
 - 5. Notation of dimensions established by field measurement.
- D. Each submittal shall bear the following information:
 - 1. Project name.
 - 2. Date.
 - 3. Name and address of ARCHITECT.
 - 4. Name and address of CONTRACTOR.
 - 5. Name and address of Subcontractor.
 - 6. Name and address of supplier.
 - 7. Name and address of manufacturer.

8. Name and title of appropriate Specification section.
9. Drawing number and detail references, as appropriate.

3.03 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of Work or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, wiring diagrams, schedules, illustrations, or performance curves.
 1. Mark each copy to show or delineate pertinent materials, products, models, applicable choices, or options. Where Product Data includes information on several products that are not required, clearly mark copies to indicate the applicable information. Include the following information:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
 - g. Notation of dimensions and required clearances.
 - h. Indicate performance characteristics and capacities.
 - i. Indicate wiring diagrams and controls.
 2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed by CONTRACTOR.

3.04 SAMPLES

- A. Procedure:

1. Submit Samples of sufficient size, quantity, cured and finished and physically identical to the proposed product or material. Samples include partial or full sections or range of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches denoting color, texture, and/or pattern.
 - a. Mount or display Samples in the manner to facilitate review of qualities indicated. Include the following:
 - 1) Specification section number and reference.
 - 2) Generic description of the Sample.
 - 3) Sampling source.
 - 4) Product name or name of manufacturer.
 - 5) Compliance with recognized standards.
 - 6) Availability and delivery time.
2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 - a. Where variations in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three (3) multiple units that show the approximate limits of the variations.
 - b. Refer to other Specification sections for requirements for Samples that illustrate materials, fabrication techniques, assembly details, connections, operation, and similar construction characteristics.
 - c. Refer to other sections for Samples to be returned to CONTRACTOR for incorporation into the Work. Such Samples must be undamaged at time of installation. On the transmittal indicate special requests regarding disposition of Sample submittals.
 - d. Samples not incorporated into the Work, or otherwise not designated as Owner property, remain the property of CONTRACTOR and shall be removed from the Project site prior to Substantial Completion.

3. Color and Pattern: Whenever a choice of color or pattern is available in a specified product, submit accurate color chips and pattern charts to OWNER for review and selection.
 4. Number Required: Submit six, minimum, of each. Two will be returned to CONTRACTOR.
- B. When specified, erect field Samples and mock-ups at the Project site to illustrate products, materials, fabrications, or execution and to establish standards by which completed Work shall be judged.
 - C. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of the Work. Sample sets may be used to obtain final acceptance of the Work associated with each set.

3.05 QUALITY CONTROL SUBMITTALS

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

END OF SECTION

SECTION 01 3546

INDOOR AIR QUALITY PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. CONTRACTOR's requirements and actions to ensure that the building and the mechanical system are free of Volatile Organic Compounds (VOCs), moisture, dust, mold, and microbes prior to achieving Substantial Completion.
2. CONTRACTOR requirements for temporary construction ventilation, dust protection, preconditioning of materials, protection of materials, sequencing, and duct protection.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 23 3000 - Air Distribution.
3. Section 23 8000 - Heating, Ventilating, and Air Conditioning Equipment.

C. Referenced Standards:

1. ASHRAE 62.1, Ventilation for Acceptable Indoor Air Quality.
2. ASHRAE 52.2, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

D. VOC-Emitting Materials. Related Sections:

1. Section 06 4000 - Architectural Woodwork.
2. Section 07 9200 - Joint Sealants.
3. Section 09 2900 - Gypsum Board.
4. Section 09 6513 - Rubber Base.
5. Section 09 9000 - Painting and Coating.

E. VOC-Emitting Furnishings and Equipment. Related Sections:

1. Section 06 4000 - Architectural Woodwork.
2. Section 10 2113 - Plastic Toilet Compartments.

F. Porous and Fibrous Materials. Related Sections:

1. Section 07 2100 - Thermal Insulation.
2. Section 09 5113 - Acoustical Panel Ceilings.

1.02 SUBMITTALS

- A. CONTRACTOR shall develop and submit to the OWNER for review and approval a Construction Indoor Air Quality (IAQ) Plan using the blank form provided after the end of this Section. Plan shall be submitted within 60 days of Notice to Proceed (NTP). Implementation of the approved IAQ Plan shall be included in the project Construction Schedule.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 QUALITY CONTROL

- A. CONTRACTOR shall conduct inspections to confirm that measures proposed in the Construction IAQ Plan are followed during construction and shall report on the progress of the Plan during the progress meetings.

3.02 PROJECT CONDITIONS

- A. During construction, prior to Substantial Completion and Building Flush Out, systems designed with particle filters shall not be operated at any time without filters in place. Filters used during construction shall have a minimum rating of MERV 8. Following construction completion, replace filters.
- B. Following completion of building envelope maintain continuous Temporary Construction Ventilation of interior areas where VOC-Emitting Materials and VOC-Emitting Furnishings and Equipment, identified in Paragraphs 1.01.D and 1.01.E of this Section, areas are installed.
1. Temporary Construction Ventilation may be supplied via the building's HVAC system and shall comply with the following requirements:

- a. Return air grilles shall be sealed or temporary MERV 8 air filters shall be installed.
 - b. Provide MERV 8 air filters to filter the outside air.
 - c. Provide a minimum of three air changes per hour of outside air while maintaining the building interior temperature between 60 degrees F and 85 degrees F with the relative humidity not to exceed 60 percent.
2. The Temporary Construction Ventilation specified requirements for building interior temperature and/or relative humidity may be exceeded only when the building HVAC unit is operating at 100 percent capacity.
 3. Temporary Construction Ventilation may be supplied via temporary ducts and fans, sufficient to provide no less than three air changes per hour and exhausted directly to the outside/outdoors while maintaining the building interior temperature between 60 degrees F and 85 degrees F with the relative humidity not to exceed 60 percent.
 4. Maintain continuous Temporary Construction Ventilation for a minimum period of 72 hours after installation of the VOC-Emitting Materials unless otherwise indicated elsewhere in these Specifications.
- C. Temporary Construction Ventilation shall be provided for post-building-flush-out, post-occupancy touch-up, or punch list activities involving VOC-Emitting materials. Touch-up activities involving VOC-Emitting Materials shall not occur when students or staff are present.
- D. Prior to installation, allow VOC-Emitting Furnishings and Equipment, identified in Paragraph 1.01.E of this Section, to off-gas in dry, well-ventilated space for 14 calendar days.
1. Remove containers and packaging to maximize off-gassing of VOCs.
 2. Precondition products in ventilated warehouse or other ventilated building. Preconditioning at the project site is acceptable, provided that Temporary Construction Ventilation and Sequencing measures are taken as described in Paragraph 3.02.B and Article 3.03 of this Section.
 3. Products requiring preconditioning include, at a minimum, VOC-Emitting Furnishings and Equipment that contain vinyl or other flexible plastics, resins, adhesives, foam rubber, and fiberboards with urea-formaldehyde binders. Products bearing CHPS-approval as low-emitting materials GREENGUARD Certification, Indoor Advantage Gold Certification, Green Label Plus Certification, or other OWNER-approved certification shall be excluded from this preconditioning requirement.

3.03 SEQUENCING

- A. Where VOC-Emitting Materials identified in Paragraph 1.01.D of this Section are applied on-site, apply the VOC-Emitting Materials prior to installation of any Porous and Fibrous Materials identified in Paragraph 1.01.F of this Section. Maintain the continuous Temporary Construction Ventilation requirements described above for a period of 72 hours before installation of porous and fibrous materials.
 - 1. Where this sequencing requirement is not possible, protect porous materials with polyethylene vapor retarders. Tape polyethylene edges to insure a complete seal. Maintain continuous ventilation per temporary construction ventilation requirements described above for a period of 72 hours before removing polyethylene.
- B. Completion: Complete interior finish material installation prior To Building Flush-Out as described in Paragraph 3.05.C of this Section.

3.04 PROTECTION

- A. Moisture Protection:
 - 1. Protect materials specified in Paragraphs 1.01.D, 1.01.E and 1.01.F of this Section from water intrusion or penetration.
 - 2. Weatherproof enclosures shall be temporarily constructed to store and protect the materials from moisture sources.
 - 3. Materials shall be covered to protect them from rain and other moisture sources and, if resting on the ground, shall use spacers to allow air to circulate between the ground and the materials.
 - 4. Materials including porous or fibrous materials with visible mold and microbial growth shall not be installed.
 - a. Non-porous materials with minor visible mold and microbial growth shall be decontaminated.
 - b. Structural lumber showing visible signs of mold shall be removed from the project site or be decontaminated, per specification Section 06 1000 - Rough Carpentry, prior to installation.
- B. Duct Protection:
 - 1. Seal ducts during transportation and delivery, per Section 23 3000, Air Distribution.

2. Seal ducts during construction to prevent accumulation of dust and debris. If seals must be removed for temporary construction ventilation purposes, they shall be resealed upon conclusion of the required ventilation period. Remove seals prior to HVAC system start-up.
3. During dust producing activities in enclosed buildings, such as drywall installation and finishing, sanding, cutting, or grinding, CONTRACTOR shall turn HVAC ventilation system off and protect HVAC system supply and return openings from dust infiltration. Separate dust-producing activities from the rest of the construction area using plastic sheathing. Provide temporary ventilation.

3.05 CLEANING

- A. Just prior to Substantial Completion, vacuum carpeted and soft surfaces with a Green Label certified vacuum.
- B. Duct Cleanliness:
 1. Before shipment to site ensure ducts are clean and duct openings protected with a self-adhering film.
 2. Just prior to Substantial Completion and prior to using any ducts to circulate air, ensure that the ducts are free of dust and dirt.
- C. Building Flush-Out:
 1. At construction completion, prior to occupancy and with all interior finishes installed, replace filtration media with new per HVAC equipment schedule and perform a building flush-out. Flush-out shall supply a total air volume of 14,000 cubic feet of outdoor air per square foot of floor area while maintaining an internal temperature of at least 60 degrees Fahrenheit and relative humidity no higher than 60%.
 2. During building flush-out, when required to perform touch-up or punch list activities involving VOC-Emitting Materials as described in Article 1.01 of this Section, extend Building Flush-Out by a minimum of four days continuously after the touch-up or punch list activities at the maximum tempered outside air rate for 24 hours per day in the space where the touch-up or punch list activities occurred.
 3. If Continuous Construction Ventilation is not possible, non-continuous flush-out shall total an equivalent of air as described in Paragraph 3.05-C.2 above.
 4. Return ventilation system to normal operation following flush-out period to minimize energy consumption.

END OF SECTION

	<p>air will be provided through open windows or doors or other transfer air devices.</p> <ul style="list-style-type: none"> • HVAC system will provide make-up air. Return air grilles will be sealed.
Required	<ul style="list-style-type: none"> • Ventilation will provide no less than three air changes per hour. • Ventilation will be continuous for a period no less than 72 hours after completion of installation of VOC-emitting materials. • Filters used during Construction Ventilation will be replaced prior to Substantial Completion

II. PRECONDITIONING (Per paragraph 3.02.D)

<p>List project materials requiring Preconditioning per Part 1 of this Section. Attach additional sheet if necessary.</p>	
<p>Circle the following Preconditioning approach to be used.</p>	
A	<p>Preconditioning will occur in dry and well-ventilated offsite location. Where is the offsite location?</p>
B	<p>Preconditioning will occur onsite. Check the applicable approach.</p> <p><input type="checkbox"/> Ventilation will be supplied via building's HVAC system. See paragraph 3.02.B above.</p> <p><input type="checkbox"/> Ventilation will be accomplished via open windows, temporary ducts, and temporary fans. See paragraph 3.02.B.3 above.</p>
Required	<ul style="list-style-type: none"> • Containers and packaging will be removed prior to Preconditioning. • Preconditioning will occur for fourteen (14) continuous days prior to installation

III. SEQUENCING (Per Article 3.03)

List project porous and fibrous materials requiring Sequencing consideration per Part 1 of this Section. Attach additional sheet if necessary.

Required	<ul style="list-style-type: none">• Previously installed Porous or Fibrous Materials located in a room where VOC-Emitting Materials are to be installed will be protected with polyethylene vapor retarder. Polyethylene will not be removed until completion of a 72-hour ventilation period.• Installation of interior finish materials will complete fourteen (14) days prior to Substantial Completion

IV. PROTECTION (Per Article 3.04)

List project materials requiring Protection per Part 1 of this Section. Attach additional sheet if necessary.

Required	<ul style="list-style-type: none">• Weatherproof enclosures shall be temporarily constructed to store and protect the materials from moisture sources. Materials shall be covered from rain and other moisture sources and if resting on the ground, use spacers to allow air to circulate between the ground and the materials.• Materials including porous or Fibrous Materials with visible microbial growth shall not be installed.• Materials that are not defined as Porous or Fibrous with visible microbial growth shall be decontaminated prior to installation. Lumber exhibiting a minor amount of “lumberyard mold” need not be discarded.• Temporary ventilation shall be provided during dust producing activities. See Item I Construction Ventilation above. Supply air diffusers and return air grilles shall be covered.• Ducts shall be sealed during transportation, delivery, and construction.
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END OF CONSTRUCTION INDOOR AIR QUALITY PLAN

SECTION 01 7329
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies procedural requirements for cutting and patching.

1.02 RELATED REQUIREMENTS

- A. Section 02 4116 - Demolition.

1.03 SUBMITTALS

- A. The word “cutting” as used in the Contract Documents includes, but is not limited to, cutting, drilling, chopping, and other similar operations and the word “patching” includes, but is not limited to, patching, rebuilding, reinforcing, repairing, refurbishing, restoring, replacing, or other similar operations.
- B. Cutting and Patching Proposal: CONTRACTOR shall submit a proposal describing procedures well in advance of the time cutting and patching will be performed if the Contract Documents requires approval of these procedures before proceeding. Include the following information, as applicable, in the proposal:
1. Describe the extent of cutting and patching required. Denote how it will be performed and indicate why it cannot be avoided.
 2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building’s appearance or other significant visual elements.
 3. List products to be used and firms or entities that will perform this Work.
 4. Indicate dates when cutting and patching will be performed.
 5. Utilities: List utilities that cutting and patching operations will disturb or affect. List utilities to be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.

6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.
7. Review by ARCHITECT and DSA prior to proceeding with cutting and patching does not waive ARCHITECT right to later require complete removal and replacement of defective Work.

1.04 QUALITY ASSURANCE

- A. Requirements for structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.
 1. Obtain approval from ARCHITECT and DSA of the cutting and patching proposal before cutting and patching the following structural elements:
 - a. Foundation construction.
 - b. Bearing and retaining walls.
 - c. Structural concrete.
 - d. Structural steel.
 - e. Lintels.
 - f. Timber and primary wood framing.
 - g. Structural decking.
 - h. Stair systems.
 - i. Miscellaneous structural metals.
 - j. Exterior curtain-wall construction.
 - k. Equipment supports.
 - l. Piping, ductwork, vessels, and equipment.
 - m. Structural systems of special construction in Division 13 Sections.
- B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.

1. Obtain review of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
 - a. Primary operational systems and equipment.
 - b. Air or smoke barriers.
 - c. Water, moisture, or vapor barriers.
 - d. Membranes and flashings.
 - e. Fire protection systems.
 - f. Noise and vibration control elements and systems.
 - g. Control systems.
 - h. Communication and/or data systems.
 - i. Conveying systems.
 - j. Electrical wiring systems.
 - k. Operating systems of special construction in Division 13 Sections.

- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the opinion of ARCHITECT, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.
 1. If possible, retain the original installer or fabricator to cut and patch the exposed Work listed below. If it is impossible to engage the original installer or fabricator, engage another recognized experienced and specialized firm.
 - a. Firestopping.
 - b. Finished wood flooring.
 - c. HVAC enclosures, cabinets, or covers.

1.05 WARRANTY

- A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.
 - 1. Before proceeding, meet at the Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.02 PREPARATION

- A. Temporary support: Provide adequate temporary support of existing improvements or Work to be cut.
- B. Protection: Protect existing improvements and Work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of existing improvements or Work that might be exposed during cutting and patching operations.
- C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Where the Work requires sandblasting of existing surfaces in order to receive new materials secured by cementitious, adhesive or chemical bond, completely remove existing finishes, stains, oil, grease, bitumen, mastic and adhesives or other substances deleterious to the new bonding or fastening of new Work. Utilize wet sand blasting for interior surfaces and for exterior surfaces where necessary to prevent objectionable production of dust.

3.03 PERFORMANCE

- A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay. Carefully remove existing Work to be salvaged and/or reinstalled. Protect and store for reuse into the Work. Verify compatibility and suitability of existing substrates before starting the Work.
- B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining Work. Where possible, review proposed procedures with the original installer; comply with the original installer's recommendations.

1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 3. Cut through concrete and masonry using a cutting machine, such as a carborundum saw or a diamond-core drill. Saw cut reinforcing bars and paint ends with bituminous paint except where bonded into new concrete. When cutting concrete paving, cut and remove to nearest existing joint line.
 4. Comply with requirements of applicable Sections of Divisions 31, 32, and 33 where cutting and patching requires excavating, backfill, and recompaction.
 5. Woodwork: Cut and or remove to a panel or joint line.
 6. Sheet Metal: Remove back to joint, lap, or connection. Secure loose or unfastened ends or edges and seal watertight.
 7. Glass: Remove cracked, broken, or damaged glass and clean rebates and stops of setting materials.
 8. Plaster: Cut back to sound plaster on straight lines, and back bevel edges of remaining plaster. Trim existing lath and prepare for new lath.
 9. Gypsum Wallboard: Cut back on straight lines to undamaged surfaces with at least two opposite cut edges centered on supports.
 10. Acoustical ceilings: Remove hanger wires and related appurtenances where ceilings are not scheduled to be installed.
 11. Tile: Cut back to sound tile and backing on joint lines.
 12. Flooring: Completely remove flooring and clean backing of prior adhesive. Carefully remove wood flooring for patching and repairing of existing wood flooring scheduled to remain.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with required tolerances.
1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation. Verify conditions of existing substrates prior to executing Work.

2. Restore exposed finishes of patched areas and extend finish restoration into retaining adjoining construction in a manner that will eliminate all evidence of patching and refinishing.
3. Concrete: Maintain cut edges in a moist condition for twenty four hours prior to the placement of new concrete. In lieu of this an epoxy adhesive may be provided. Finish placed concrete to match existing unless noted otherwise. Concrete shall have a compressive strength of 3,000 psi where installed to repair and match existing improvements, unless noted otherwise.
4. Metal Fabrications: Items to remain exposed shall have their edges cut and ground smooth and rounded.
5. Sheet Metal: Replace removed or damaged sheet metal items for new Work.
6. Glass: Install matching glass and re-seal exterior window assemblies.
7. Lath and Plaster: Install new lath materials to match existing and fasten to supports at 6-inch centers. Provide a 6-inch lap where new lath to adjoins existing lath. Fasten new lath as required for new Work. Restore paper backings as required. Apply a bonding agent on cut edges of existing plaster. Apply three coat plaster of the type, thickness, finish, texture, and color to match existing.
8. Gypsum Wallboard: Fasten cut edges of wallboard. Install patches with at least two opposite edges centered on supports and secure at 6-inch centers. Tape and finish joints and fastener heads. Patching shall be non-apparent when painted or finished.
9. Acoustical Ceilings: Comply with the requirements for new Work specified in related sections of the Contract Documents.
10. Resilient Flooring: Completely remove flooring and prepare substrate for new material.
11. Painting: Prepare areas to be patched, patch and paint as specified under related sections of the Contract Documents.

3.04 CLEANING

- A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged coverings to their original condition.

END OF SECTION

SECTION 01 7419

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Preparation and implementation, including reporting and documentation, of a Waste Management Plan for reusing, recycling, salvage or disposal of non-hazardous waste materials generated during demolition and new construction (Construction and Demolition (C&D) Waste), to foster material recovery and re-use and to minimize disposal in land fills.
- B. Related Requirements
 - 1. Section 01 3300 - Submittal Procedures.
 - 2. Section 01 5000 - Construction Facilities and Temporary Controls.
 - 3. Section 01 7700 - Contract Closeout.

1.02 REFERENCES

- A. California Integrated Waste Management Act of 1989 (AB 939).
- B. California Code of Regulations Title 14, Section 18700 et seq.
- C. California Green Building Standards Code.

1.03 SYSTEM DESCRIPTION

- A. Collection and separation of all C&D waste materials generated on-site, reuse or recycling on-site, transportation to approved recyclers or reuse organizations, or transportation to legally designated landfills, for the purpose of recycling salvaging and reusing a minimum of 75 percent of the C&D waste generated.

1.04 SUBMITTALS

- A. C&D Waste Management Plan (Exhibit 1): Within 10 calendar days after the Notice to Proceed and prior to any waste removal, submit the following to the OAR for review and approval. Update quarterly. Include:
 - 1. Materials to be recycled, reused, or salvaged, either onsite or offsite.
 - 2. Estimates of C&D waste quantity (in tons) by type of material. (If waste is measured by volume, give factors for conversion to weight in tons.)
 - 3. Procedures for recycling and reuse program.
 - 4. Permit or license and location of Project waste-disposal areas.
 - 5. Site plan for placement of waste containers.

- B. C&D Waste Management Monthly Progress Report (Exhibit 2): Summary of waste generated by Project, monthly with Application for Payment. Include:
 - 1. Firms accepting the recovered or waste materials.
 - 2. Type and location of accepting facilities (landfill, recovery facility, used materials yard, etcetera). If materials are reused or recycled on the Project site, location should be designated as “on-site reuse and recycling”.
 - 3. Type of materials and net weight (tons) of each.
 - 4. Value of the materials or disposal fee paid.
 - 5. Attach weigh bills and other documentation confirming amount and disposal location of waste materials.
- C. C&D Waste Management Final Compliance Report: Final update of Waste Management Plan to provide summary of total waste generated by Project.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 IMPLEMENTATION

- A. Implement approved Waste Management Plan including collecting, segregating, storing, transporting and documenting each type of waste material generated, recycled or reused, or disposed in landfills.
- B. Designate an on-site person to be responsible for instructing workers and overseeing the sorting and recording of waste/ recyclable materials.
- C. Include waste management and recycling in worker orientation and as an agenda item for regular Project meetings.
- D. Recyclable and waste bin areas shall be limited to areas approved on the Waste Management Plan. Keep recycling and waste bins neat and clearly marked to avoid contamination of materials.

3.02 ATTACHMENTS

- A. Exhibit 1: Waste Management Plan
- B. Exhibit 2: Waste Management Monthly Progress Report.

EXHIBIT 1

**WASTE MANAGEMENT PLAN
CONSTRUCTION/ MAINTENANCE/ALTERATION & DEMOLITION PROJECTS**

PROJECT NAME: «PROJECTTITLE» «CONTRACTTITLE»
 PROJECT NO: «Project Number»
 NAME OF COMPANY: _____
 CONTACT PERSON: _____
 TELEPHONE: _____
 PROJECT SITE LOCATION: _____
 PROJECT TYPE: NEW CONSTRUCTION DEMOLITION
 MAINTENANCE/ALTERATION PROJECTS
 PROJECT SIZE (SQ. FT.): _____
 DATE & ESTIMATED PERIOD _____

(1) Material Type	(2) Tons Estimated Recycle	(3) Tons Estimated Reuse	(4) Tons Estimated Salvage	(5) Tons Estimated Landfill	(6) Proposed Disposal or Recycling Facility (e.g., Onsite, Name of Facility)
Total					
Diversion Rate: Columns [(2)+(3)+(4)] / [(2)+(3)+(4)+(5)]					=

Signature	Title	Date
-----------	-------	------

- Column 1 "Material Types" – Enter type of materials targeted for recycling, reuse, and/or salvage, either on- or off-site, and include a category for waste materials requiring disposal.
- Columns 2 thru 4 "Estimated Generation" - Enter estimated quantities (tons) of recyclable, reusable, or salvageable waste materials anticipated to be generated and state number of salvageable items.
- Column 5 "Estimated Landfill" - Enter quantities (tons) of materials to be disposed in landfill.
- Column 4 "Disposal Location" - Enter end-destination of recycled, salvaged, and disposed materials.
- General : (1) Attach proposed Recycling and Waste Bin Location Plan.
 (2) Attach name and contact data for each recycling or disposal destination to be used.

EXHIBIT 2

**WASTE MANAGEMENT PROGRESS REPORT
CONSTRUCTION/ MAINTENANCE/ALTERATION & DEMOLITION PROJECTS**

PROJECT NAME: «PROJECTTITLE» «CONTRACTTITLE»
 PROJECT NO: «Project Number»
 NAME OF COMPANY: _____
 CONTACT PERSON: _____
 TELEPHONE: _____
 PROJECT SITE LOCATION: _____
 PROJECT TYPE: NEW CONSTRUCTION DEMOLITION
 MAINTENANCE/ALTERATION PROJECTS
 PROJECT SIZE (SQ. FT.): _____
 PERIOD _____ to _____

(1) Material Type	(2) Tons Actual Recycle	(3) Tons Actual Reuse	(4) Tons Actual Salvage	(5) Tons Actual Landfill	(6) Disposal or Recycling Facility (e.g., Onsite, Name of Facility)
Total					
Diversion Rate: Columns [(2)+(3)+(4)] / [(2)+(3)+(4)+(5)]					=

Signature	Title	Date
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- Column 1 "Material Types" – Enter type of materials targeted for recycling, reuse, and/or salvage, either on- or off-site, and include a category for waste materials requiring disposal.
- Columns 2 thru 4 "Estimated Generation" - Enter estimated quantities (tons) of recyclable, reusable, or salvageable waste materials anticipated to be generated and state number of salvageable items.
- Column 5 "Estimated Landfill" - Enter quantities (tons) of materials disposed.
- Column 4 "Disposal Location" - Enter end-destination of recycled, salvaged, and disposed materials.
- General : (1) Attach proposed Recycling and Waste Bin Location Plan.
 (2) Attach name and contact data for each recycling or disposal destination to be used.

END OF SECTION.

SECTION 01 7700

CONTRACT CLOSEOUT

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.
 2. Project record documents submittal.
 3. Operation and maintenance manual submittal.
 4. OWNER orientation and instruction.
 5. Final cleaning.

1.02 RELATED REQUIREMENTS:

1. Section 01 3300 - Submittal Procedures.
2. Section 01 7836 - Warranties.

PART 2 – PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 SUBSTANTIAL COMPLETION

- A. Inspection Procedures: On receipt of the Request For Certificate of Substantial Completion, OWNER will authorize commencement of inspection. INSPECTOR, OWNER, CONTRACTOR and ARCHITECT will inspect the Work.
1. If after inspection of the Work, OWNER does not consider the Work substantially complete, OWNER will notify CONTRACTOR.

2. If after inspection, OWNER considers the Work substantially complete, INSPECTOR shall prepare a comprehensive Punch List of items to be corrected.
 - a. INSPECTOR may repeat inspection to assure the Work is corrected.
 - b. Results of the completed inspection will form a partial basis of the requirements for Release of Retention.

3.02 ADMINISTRATIVE CLOSEOUT

- A. Re-inspection Procedures: INSPECTOR, OWNER, CONTRACTOR and ARCHITECT may inspect the Work upon notice, including final inspection of Punch List items from earlier inspections, has been corrected, except for items whose completion is delayed under circumstances acceptable to OWNER.
 1. OWNER has the right to preclude CONTRACTOR from Punch List correction and documents submittals after the Contract Completion date; unless OWNER elects to authorize CONTRACTOR to extend Administrative Contract duration. CONTRACTOR will be assessed actual cost for the unsettled items. Withholds amounts exceeding actual costs to correct or to obtain deliverable will be released.
 2. If allowed by the OWNER, re-inspection will be repeated, but may be assessed against CONTRACTOR if OWNER is subject to additional professional service and or additional costs of inspection.

3.03 PROJECT RECORD DOCUMENT SUBMITTAL

- A. General: Do not use project record documents for construction purposes. Protect record documents from deterioration and loss. Provide access to record documents for ARCHITECT, INSPECTOR and OWNER reference during normal working hours. Project record document shall be updated on a weekly basis. Prior to submitting each application for payment, secure INSPECTOR and ARCHITECT approval of project record documents.
- B. Record Drawings: Maintain a clean, undamaged set of prints of Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark the Drawing that is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Drawings. Provide detailed and accurate field dimensions for concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work. Date and number entries in the same format as submitted. Call attention to entry by a “cloud” around the affected areas.
 2. Mark new information important to OWNER but was not shown on Drawings or Shop Drawings.
 3. Utility location and depth below finished grade and above ceilings and attic spaces shall be fully dimensioned and indicated on record drawings. Dimensions shall be measured from building lines or permanent landmarks and shall be triangulated to those features.
 4. Note related Change Order or Construction Directive numbers where applicable. RFC submissions shall be referenced on each affected sheet, Drawing and Shop Drawing.
 5. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
 6. Prior to Contract Completion of the Work, review of the project record drawings by ARCHITECT; prepare a final set of project record drawings using reproducible vellum. Submit final set of transparencies to ARCHITECT.
- C. Record Specifications: Maintain two complete copies of the Specifications, including Addenda. Include with the Specifications two copies of other written Contract Documents, such as Change Orders or Construction Directives issued during construction.
1. Mark these record documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
 2. Give particular attention to substitutions and selection of options and information on concealed Work that cannot otherwise be readily discerned later by direct observation.
 3. Note related record document information with Product Data.
 4. Prior to Contract Completion of the Work, submit record Specifications to ARCHITECT for OWNER records.

- D. Record Product Data: Maintain two copies of each Product Data submittal. Note related Change Orders and Construction Directives and mark-up of record drawings and Specifications.
1. Mark these documents to illustrate significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Project site and from the manufacturer's installation instructions and recommendations.
 2. Provide detailed and accurate information regarding concealed products and portions of Work that cannot otherwise be readily discerned later by direct observation.
 3. Prior to Contract Completion, submit complete set of record Product Data to ARCHITECT for OWNER records.
- E. Record Samples: Immediately prior to Substantial Completion, CONTRACTOR shall meet with ARCHITECT and OWNER at the Project site to determine which Samples are to be transmitted to OWNER for record purposes. Comply with OAR instructions regarding delivery to OWNER storage area.
- F. Miscellaneous Records: Refer to other Specification sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Prior to the date of Contract Completion, complete and compile miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to Architect for OWNER records.
- G. Maintenance Manuals: Prior to Substantial Completion, organize operation and maintenance data into suitable two sets of manageable size. Bind properly indexed data in individual, heavy-duty, two to three-inch 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Submit to ARCHITECT for OWNER records. Include the following types of information.
1. Emergency instructions.
 2. Spare parts list.
 3. Copies of warranties.
 4. Wiring diagrams.
 5. Recommended "turn-around" cycles.
 6. Inspection procedures.

7. Shop Drawings and Product Data.
 8. Fixture lamping schedule.
- H. Verified Reports: Construction progress of the Work shall be reported to DSA via a duly verified report as per Title 24, Part 1, Sections 4-336 and 4-343.c of the California Building Standards Commission's, California Administrative Code.

3.04 OPERATION AND MAINTENANCE:

- A. Operation and Maintenance Instructions: Prior to Substantial Completion, arrange for each installer of equipment that requires regular operation and maintenance to meet with designated OWNER personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
1. Maintenance manuals.
 2. Spare parts and materials.
 3. Tools.
 4. Lubricants.
 5. Fuels.
 6. Identification systems.
 7. Control sequences.
 8. Hazards.
 9. Cleaning.
 10. Warranties and bonds.
 11. Maintenance agreements and similar continuing commitments.
- B. As part of instruction for operating equipment, demonstrate the following procedures:
1. Start-up.
 2. Shutdown.
 3. Emergency operations.

4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

3.05 FINAL CLEANING

- A. General: Related sections of the Contract Documents specify general cleaning during performance of the Work. General cleaning is included in Division 01 Section “Construction Facilities and Temporary Controls”.
- 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.
 1. Complete the following cleaning operations before requesting inspection for a certificate of Substantial Completion.
 - a. Remove labels that are not permanent labels.
 - b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
 - c. Clean exposed exterior and interior hard-surfaced finished to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
 - d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
 - e. Clean the Project site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

END OF SECTION

SECTION 01 7836

WARRANTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section includes administrative and procedural requirements for warranties, including manufacturers and installer's standard warranties on products and special product warranties.
 - 1. Refer to the General Conditions for terms of the guarantee period for the Work.

1.02 RELATED REQUIREMENTS

- A. Section 01 7700 - Contract Closeout.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 WARRANTY REQUIREMENTS

- A. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties shall not relieve CONTACTOR of the warranty of the Work incorporating such materials, products, and equipment. Manufacturer's disclaimers and limitations on warranties do not relieve suppliers, manufacturers, installers, and Subcontractors of the requirement to countersign special warranties with CONTRACTOR.
- B. Standard warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to OWNER.
- C. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for OWNER.
- D. Related Damages and Losses: When correcting failed or defective warranted Work, remove and replace Work that has been damaged as a result of such failure

or which must be removed and replaced to provide access for correction of warranted Work.

- E. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement with the reinstated warranty equal to the original warranty.
- F. Replacement Cost: Upon determination the Work covered by a warranty has failed and/or is defective, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. CONTRACTOR is responsible for the cost of replacing or rebuilding defective Work regardless of whether OWNER has benefited from use of the Work through a portion of its anticipated useful service life.
- G. OWNER Recourse: Expressed warranties made to OWNER are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which OWNER can enforce such other duties, obligations, rights, or remedies.
- H. Rejection of Warranties: OWNER reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- I. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, OWNER reserves the right to refuse to accept the Work until CONTRACTOR presents evidence the entities required to countersign such commitments have done so.

3.02 SUBMITTALS

- A. Submit written preliminary warranties prior to Substantial Completion and final warranties prior to Contract Completion. If the certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, submit written warranties as set forth in the certificate of Substantial Completion.
 - 1. When a designated portion of the Work is partially used and/or occupied by OWNER, submit properly executed warranties to ARCHITECT within fifteen days of the Partial Use or Occupancy of the designated portion of the Work.
- B. When the Contract Documents require CONTRACTOR, or CONTRACTOR and a Subcontractor, installer, supplier or manufacturer to execute a special warranty, prepare a written document containing appropriate terms and identification, ready

for execution by the required parties. Submit a draft to OWNER, and ARCHITECT, for approval prior to final execution.

1. Refer to Divisions 02 through 49 for specific content requirements and particular requirements for submitting special warranties.
- C. Form of Submittal: Prior to Contract Completion, compile two copies of each required final warranty properly executed by CONTRACTOR, or by CONTRACTOR and Subcontractor, installer, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the Specifications.
- D. Bind warranties and bonds in heavy-duty, commercial-quality, durable three ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8½ by 11 paper.
1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the item or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the installer.
 2. Identify each binder on the front and spine with the typed or printed title “WARRANTIES,” Project title and/or name, and name of CONTRACTOR.
 3. When warranted Work requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

END OF SECTION

SECTION 02 4116

DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Furnishing labor, materials and equipment necessary for demolition, dismantling, cutting and alterations as indicated, specified, or required for completion of the Work. Includes items such as the following:
1. Protection of existing improvements to remain.
 2. Cleaning existing improvements to remain.
 3. Disconnecting and capping utilities.
 4. Removing debris, waste materials, and equipment.
 5. Removal of items for performance of the Work.
 6. Salvageable items to be retained by the Owner.
- B. Related Requirements:
1. Division 01 - General Requirements.
 2. Section 01 1100 - Summary of Work.
 3. Section 01 5000 - Construction Facilities and Temporary Controls.
 4. Section 01 7329 - Cutting and Patching.
 5. Section 01 7419 - Construction and Demolition Waste Management.
 6. Division 22 — Plumbing.
 7. Division 23 — HVAC.
 8. Division 26 — Electrical.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating the extent of items and systems to be removed. Indicate items to be salvaged or items to be protected during demolition. Indicate locations of utility terminations and the extent of abandoned lines to be removed. Include details indicating methods and location of utility terminations.

1.03 QUALITY ASSURANCE

- A. Perform the Work of this section by workers skilled in the demolition of buildings and structures. Perform the Work of this section under direct superintendence at all times.
- B. Prior to commencement of Work, schedule a walkthrough with the OWNER, to confirm Owner property items have been removed from scheduled Work areas. Identify and mark remaining property items and schedule their removal.
- C. Coordinate demolition for the correct sequence, limits, and methods. Schedule demolition Work to create least possible inconvenience to the public and facility operations.
- D. Related Standards:
 - 1. ANSI/ASSE A10.6.
 - 2. CBC Chapter 33.
 - 3. CFC Chapters 11 and 33.
 - 4. NFPA 241

1.04 PROJECT CONDITIONS

- A. Drawings may not indicate in detail all demolition Work to be performed. Examine existing conditions to determine the full extent of required demolition.
- B. Repair damage to existing improvements or damage due to excessive demolition.
- C. Provide all measures to avoid excessive damage from inadequate or improper means and methods, improper shoring, bracing or support.
- D. If conditions are encountered that varies from those indicated, promptly notify the Architect for clarification before proceeding.

PART 2 - PRODUCTS

2.01 HANDLING OF MATERIALS

- A. Items scheduled for salvage by the OWNER shall be delivered to a location designated by the OWNER. Items shall be cleaned, packaged and labeled for storage.
- B. Items scheduled for reuse shall be stored on the Project site and protected from damage, theft and other deleterious conditions.

PART 3 - EXECUTION

3.01 GENERAL

- A. Protection:

1. Do not commence demolition until safety partitions, barricades, warning signs and other forms of protection are installed. Refer to Section 01 5000 - Construction Facilities and Temporary Controls.
 2. Provide safeguards, including warning signs, lights and barricades, for protection of workers, occupants, and the public.
- B. If safety of existing construction appears to be endangered, take immediate measures to correct such conditions; cease operations and immediately notify the OWNER.

3.02 DEMOLITION

- A. Do not throw or drop materials. Furnish ramps or chutes as required by the Work.
- B. Remove existing construction only to extent necessary for proper installation of Work and interfacing with existing construction. Cut back finished surfaces to straight, plumb or level lines as required for a smooth transition.
- C. Where openings are cut oversize or in improper locations, replace or repair to required condition.

3.03 CUTTING EXISTING CONCRETE

- A. Cutting of existing concrete shall be performed by skilled workers familiar with the requirements and space necessary for placing concrete. Perform concrete cutting with concrete cutting wheels and hand chisels. Do not damage concrete intended to remain.
- B. Extent of cutting of structural concrete shall be as indicated on Drawings. Cutting of non-structural concrete shall be as indicated on Drawings or as reviewed by the Architect or structural engineer. Replace concrete demolished in excess of amounts indicated.
- C. Prior to cutting or coring concrete, determine locations of hidden utilities or other existing improvements and provide necessary measures to protect them from damage.

3.04 REMOVAL OF EXISTING PLUMBING AND ELECTRICAL EQUIPMENT AND SERVICES

- A. Remove existing plumbing and electrical equipment fixtures and services not indicated for reuse and not necessary for completion of the Work. Remove abandoned lines and cap unused portions of existing lines.

3.05 REMOVAL OF OTHER MATERIALS

- A. Masonry: Cut back to joint lines and remove mortar without damaging units to remain. Allow space for repairs to backing where applicable.
- B. Woodwork: Cut or remove to a joint or panel line.

- C. Roofing: Remove as required, including accessory components such as insulation and flashings. At penetrations through existing roofing, trim cut edges back to sound roofing with openings restricted to the minimum size necessary to receive Work.
- D. Sheet Metal: Remove back to joint, lap, or connection. Secure loose and unfastened ends or edges and provide a watertight condition. Re-seal as required.
- E. Glass: Remove broken or damaged glass and clean rebates and stops of glazing channels.
- F. Modular materials such as acoustical ceiling panels, resilient tile, or ceramic tile: Remove to a natural joint without leaving damaged or defective Work where joining new Work. After flooring removal, clean substrates to remove setting materials and adhesives.
- G. Gypsum Board: Remove to a panel joint line on a stud or support line.
- H. Plaster: Saw cut plaster on straight lines, leaving a minimum 2-inch width of firmly attached metal lath for installing new lath and plaster.
- I. Remove existing improvements not specifically indicated or required but necessary to perform Work. Cut to clean lines, allowing for installation of Work.

3.06 PATCHING

- A. Patch or repair materials to remain when damaged by the performance of the Work of this section. Finish material and appearance of patch and/or repair Work shall match existing.

3.07 CLEANING

- A. Clean existing materials to remain with appropriate tools and equipment.
- B. Protect existing improvements during cleaning operations.
- C. Debris shall be dampened by fog water spray prior to transporting by truck.
- D. Debris pick-up area shall be kept broom-clean and shall be washed daily with clean water.
- E. Remove waste and debris, other than items to be salvaged. Turn over salvaged items to Owner, or store and protect for reuse where required. Continuously clean up and remove items as demolition Work progresses.
- F. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 03 2000

CONCRETE REINFORCING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Concrete steel reinforcement.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4523: Testing and Inspection.
3. Section 03 3000: Cast-In-Place Concrete.

1.02 REGULATORY REQUIREMENTS

- ###### A. Fabrication and placement of reinforcing shall be in accordance with requirements of CBC, Chapter 19A.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. ASTM A184 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
3. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
4. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
5. ASTM A497 - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
6. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

7. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
- B. American Concrete Institute (ACI) Publication:
1. ACI SP-66 – ACI Detailing Manual.
 2. ACI 318 – Building Code Requirements for Structural Concrete, as modified by CBC.
- C. American Welding Society (AWS):
1. AWS D1.4 – Structural Welding Code – Reinforcing Steel.

1.04 SUBMITTALS

- A. Shop Drawings: Submit steel reinforcement Shop Drawings in accordance with ACI 315. Include assembly diagrams, bending charts and slab plans. Indicate lengths and location of splices, size and lengths of reinforcing steel.
- B. Closeout Submittals: Record exact locations of reinforcing that vary from Shop Drawings.

1.05 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement:
1. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice.
 2. American Welding Society (AWS).
 3. American Concrete Institute (ACI).
 4. CBC, Chapter 19A, Concrete.
- B. Source Quality Control: Refer to Division 01 Sections for general requirements and to the following paragraphs for specific procedures. Testing laboratory retained by the OWNER shall select test Samples of bars, ties, and stirrups from the material at the Project Site or from the place of distribution, with each Sample consisting of not less than two 18 inch long pieces, and perform the following tests according to ASTM A615, or ASTM A706, as applicable:
1. Identified Bars: If Samples are obtained from bundles as delivered from the mill, identified as to heat number, accompanied by mill analyses and mill test reports, and properly tagged with the identification certificate so as to be readily identified, perform one tensile and one bend test for each 10 tons or fraction thereof of each size of bars. Submit mill reports when Samples are selected.

2. Unidentified Bars: When positive identification of reinforcing bars cannot be performed and when random Samples are obtained; perform tests for each 2.5 tons or fraction thereof, one tensile and one bend test from each size of bars.
- C. Certification of Welders: Shop and Project site welding shall be performed by welding operators certified by AWS.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Avoid exposure to dirt, moisture or conditions harmful to reinforcing.
- B. Reinforcing steel bars, wire, and wire fabric shall be stored on the Project site to permit easy access for examination and identification of each shipment. Material of each shipment shall be separated for size and shape.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide reinforcing of sizes, gages and lengths indicated, bent to indicated shapes.

2.02 MATERIALS

- A. Steel Reinforcing Bars: ASTM A615, or ASTM A706 deformed grade 60 billet steel unless otherwise specified or indicated.
- B. Bars or Rod Mats: ASTM A184.
- C. Welded Wire Fabric for Reinforcement: ASTM A185.
- D. Tie Wire: ASTM A82, fully annealed, copper-bearing steel wire, 16 gage minimum.
- E. Chairs, Spacers, Supports, and Other Accessories: Standard manufacture conforming to ACI 315 fabricated from steel wire of required types and sizes. For reinforcement supported from grade, provide properly sized dense precast blocks of concrete.

2.03 FABRICATION OF REINFORCING BARS

- A. Comply with CRSI Manual of Standard Practice for Reinforced Concrete Construction for fabrication of reinforcing steel.
- B. Bending and Forming: Fabricate bars of the indicated sizes and bend and form to required shapes and lengths by methods not injurious to materials. Do not heat reinforcement for bending. Bend bars No. 6 size and larger in the shop only. Bars with unscheduled kinks or bends are not permitted. Provide only tested and permitted bar materials.

- C. Welding: Provide only ASTM A706 steel where welding is indicated. Perform welding by the direct electric arc process in accordance with AWS D1.4 and specified low-hydrogen electrodes. Preheat 6 inches each side of joint. Protect joints from drafts during the cooling process; accelerated cooling is not permitted. Do not tack weld bars. Clean metal surfaces to be welded of loose scale and foreign material. Clean welds each time electrode is changed and chip burned edges before placing welds. When wire brushed, the completed welds must exhibit uniform section, smooth welded metal, feather edges without undercuts or overlays, freedom from porosity and clinkers, and good fusion and penetration into the base metal. Cut out welds or parts of welds deemed defective, using chisel, and replace with proper welding. Prequalification of welds shall be in accordance with CBC requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Bars shall be bent cold. Bars partially embedded in concrete shall not be field bent except as indicated on reviewed Shop Drawings.
- B. Before installation and just prior to placing concrete, clean reinforcing of loose scale, rust, oil, dirt and any coating that could reduce bond.
- C. Accurately position, install, and secure reinforcing to prevent displacement during the placement of concrete.
- D. Provide metal chairs to hold reinforcement the required distance above form bottoms. In beams and slab construction, provide chairs under top slab reinforcement as well as under bottom reinforcement. Space chairs so that reinforcement will not be displaced during installation. Provide metal spacers to secure proper spacing. Stirrups shall be accurately and securely wired to bars at both top and bottom. At slabs, footings, and beams in contact with earth, provide concrete blocks to support reinforcement at required distance above grade.
- E. Install and secure reinforcement to maintain required clearance between parallel bars and between bars and forms. Lapped splices shall be installed wherever possible in a manner to provide required clearance between sets of bars. Stagger lapped splices. Dowels and bars extending through construction joints shall be secured in position against displacement before concrete is installed and subsequently cleaned of concrete encrustations while they are still soft.
- F. Do not install reinforcing in supported slabs and beams until walls and columns have been installed to underside of slabs and beams or until construction joints have been thoroughly cleaned. Reinforcing shall be inspected before placement of concrete and cleaned as required.
- G. Use deformed bars unless otherwise indicated, except for spiral reinforcement.

3.02 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.03 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Cast-in-place normal weight and lightweight concrete, placement and finishing.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 2000: Concrete Reinforcing.

1.02 REFERENCES

A. American Concrete Institute (ACI) Publication:

1. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 301 – Specifications for Structural Concrete.
3. ACI 302.1R – Guide for Concrete Floor and Slab Construction.
4. ACI 305R - Specification for Hot Weather Concreting.
5. ACI 306.1 – Standard Specification for Cold Weather Concreting.
6. ACI 308R – Guide to External Curing of Concrete.
7. ACI 318 - Building Code Requirements for Structural Concrete, as modified by CBC Sections 1903A and 1905A.

B. American Society for Testing and Materials (ASTM) Standards:

1. ASTM C31 – Standard Specification for Making and Curing Concrete Test Specimens in the Field.
2. ASTM C33 - Standard Specification for Concrete Aggregates.
3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

4. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
5. ASTM C88 - Standard Test Method for Soundness of Aggregates by use of Sodium Sulphate or Magnesium Sulphate.
6. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
7. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
8. ASTM C150 - Standard Specification for Portland Cement.
9. ASTM C156 – Standard Test Method for Water Loss (from a Mortar Specimen) Through Liquid membrane-Forming Curing Compounds for Concrete.
10. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
11. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete.
12. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
13. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
14. ASTM C289 - Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).
15. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
16. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
17. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
18. ASTM C567 - Standard Test Method for Determining Density of Structural Lightweight Concrete.
19. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
20. ASTM C845 - Standard Specification for Expansive Hydraulic Cement
21. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
22. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

23. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
24. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
25. ASTM C1315 – Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
26. ASTM D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
27. ASTM C1567 - Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).
28. ASTM D1751 - Standard Test Method for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
29. ASTM D7234 – Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
30. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
31. ASTM E1155 - Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.
32. 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.
33. ASTM E1745 - Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
34. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
35. ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
36. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probes.
37. ASTM F3010 – Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use under Resilient Floor Coverings.

1.03 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating locations of cast-in-place concrete Work and accessory items such as vapor barriers. Include details and locations of reinforcing, embedded items, and interfacing with other Work.
- B. Mix Design Data: Submit concrete mix designs as specified herein and in Article 2.02.
 - 1. Submit name, address and telephone number of the concrete production facility which the contractor intends to engage to design the concrete mixes. Submit name and qualifications of the proposed concrete technologist.
 - 2. Mix Design: Submit a concrete mix design for each strength and type of concrete indicated in the drawings or specified. Include water/cement ratio, source, size and amount of coarse aggregate and admixtures. Predict minimum compressive strength, maximum slump and air content percentage. Clearly indicate locations where each mix design will be used.
 - a. Water/cement ration for concrete slabs on grade shall be 0.50 maximum.
 - 3. Test Reports: Submit copies of test reports showing that the proposed mixes produce concrete with the strengths and properties specified. Include tests for cement, aggregates and admixtures. Provide gradation analysis.
- C. Material Samples: Submit Samples illustrating concrete finishes and hardeners, minimum 12-inch by 12-inch.
- D. Certificates: Submit certification that each of the following conforms to the standards indicated:
 - 1. Portland cement: ASTM C150.
 - 2. Normal weight concrete aggregates: ASTM C33.
 - 3. Lightweight concrete aggregates: ASTM C330.
 - 4. Aggregates: Submit evidence that the aggregate is not reactive in the presence of cement alkalis. In the absence of evidence, aggregate shall be tested by one of the methods in ASTM C33 Appendix XI, Methods for Evaluating Potential for Deleterious Expansion Due to Alkali Reactivity of an Aggregate. . Aggregates deemed to be deleterious or potentially deleterious may be used with the addition of a material that has been shown to prevent harmful expansion in accordance with Appendix XI of ASTM C33, when approved by the building official, in accordance to CBC Section 1903A5A.
 - 5. Curing materials: ASTM C171.
- E. Admixtures: Submit product data for proposed concrete admixtures.

1.04 QUALITY ASSURANCE

- A. Continuous inspection shall be provided at the batch plant and for transit-mixed concrete to run check sieve analysis of aggregate, check moisture content of fine aggregate, check design of mix, check cement being used with test reports, check loading of mixer trucks, and certify to quantities of materials placed in each mixer truck.
- B. Inspection shall be performed by a representative of a testing laboratory selected by the OWNER. OWNER will pay for inspection costs. Notify the laboratory 24 hours in advance of time concrete is to be mixed. Notify the laboratory of postponement or cancellation of mixing within at least 24 hours of scheduling time.
- C. CONTRACTOR shall assist the testing laboratory in obtaining and handling samples at the project site and at the source of materials.
- D. Continuous batch plant inspection requirement may be waived in accordance with CBC Section 1705A.3.3.1. Waiver shall be in writing, including DSA approval. When batch plant inspection is waived by DSA, the following requirements shall be met:
 - 1. Approved inspector of the testing laboratory shall check the first batching at the start of work and furnish mix proportions to the licensed weightmaster.
 - 2. Licensed weightmaster shall positively identify materials as to quantity and certify to each load by a ticket.
 - 3. Tickets shall be transmitted to the Inspector by a truck driver with load identified thereon. The Inspector will not accept the load without a load ticket identifying the mix and will keep a daily record of placements, identifying each truck, its load and time of receipt and approximate location of deposit in the structure and will transmit a copy of the daily record to DSA.
 - 4. At the end of the project, the weightmaster shall furnish an affidavit to DSA certifying that all concrete furnished conforms in every particular to proportions established by mix designs.
- E. Special Inspections and Tests shall be in accordance with CBC Chapter 17A, Reinforcement and Anchor testing per CBC Section 1910A and Specification Section 01 4523.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Store cement and aggregate materials so as to prevent their deterioration or intrusion by foreign matter. Deteriorated or contaminated materials shall not be furnished.
- B. Packaged materials shall bear the manufacturers and brand name label, and shall be stored in their original unbroken package in a weather tight place until ready for use in the work.

1.06 PROJECT CONDITIONS

- A. Cold Weather Requirements: Batching, mixing, delivering and placing of concrete in cold weather shall comply with the applicable requirements of ACI 306.1.
- B. Hot Weather Requirements: Batching, mixing, delivering and placing of concrete in hot weather shall comply with the applicable requirements of ACI 305R.
- C. Concrete temperature of freshly mixed concrete shall be determined per ASTM C1064.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cement: ASTM C150. Portland Cement.
- B. Aggregates: Conform to the following standards:
 - 1. Normal weight concrete: ASTM C33.
 - 2. Lightweight concrete: ASTM C330, with fine aggregates per ASTM C33.
 - 3. Aggregate shall be tested for Potential Alkali Reactivity of Cement-Aggregate Combinations per ASTM C289.
 - 4. Nominal maximum size of coarse aggregate shall be no larger than:
 - a. $\frac{1}{5}$ the narrowest dimension between sides of forms, nor
 - b. $\frac{1}{3}$ the depth of slabs, nor
 - c. $\frac{3}{4}$ the clear spacing between individual reinforcing bars or wires, bundles of bars, individual tendons, or ducts.
 - d. CONTRACTOR may request the ARCHITECT and DSA waiver of the above limitations reported per ACI 318, provided that the workability and methods of consolidation are such that the concrete can be placed without honeycombs or voids.
- C. Water: Water for concrete mixes, curing and cleaning shall be potable and free from deleterious matter.
- D. Admixtures: Shall be shown capable of maintaining essentially the same composition and performance throughout the work as the product used in establishing concrete proportions in accordance with ACI 318, Section 3.6.
 - 1. Admixtures containing chlorides or sulfides are not permitted.
 - 2. Air-entraining admixtures shall comply with ASTM C260. Air-entrained admixtures shall not be used for floor slabs to receive steel trowel finish.

3. Admixtures for water reduction and setting time modification shall conform to ASTM C494.
 4. Admixtures for producing flowing concrete shall conform to ASTM C1017.
 5. Admixtures containing ASTM C845 expansive cements shall be compatible with the cement and produce no deleterious effects.
 6. Silica fumes used as an admixture shall conform to ASTM C1240.
- E. Reinforcement Fibers: Chop strands of alkali-resistant polypropylene or nylon fibers added to the concrete mix for protection against shrinkage cracks.
- F. Expansion Joint Fillers: Preformed strips, non-extruding and resilient bituminous type, of thickness indicated, conforming to ASTM D1751.
- G. Curing:
1. Curing Paper: Shall conform to ASTM C171 and consist of two sheets of kraft paper cemented together with a bituminous material in which are embedded cords or strands of fiber running in both directions. The paper shall be light in color, shall be free of visible defects, with uniform appearance.
 2. Elevated slabs and slabs on grade may be cured at CONTRACTOR's option with curing and proactive water vapor emission and alkalinity control system. Products shall be approved by OWNER's Office of Environmental Health and Safety.
 - a. VaporSeal 309, by Floor Seal Technology, Inc., or equal.
 - 1) ASTM C156: 0.39 kg/m².
 - 2) ASTM C309: Exceeds requirements.
 - 3) ASTM C1315: Exceeds requirements.
 - 4) ACI 308R-01 Compliant.
 - b. Remedial Treatment: Water vapor emission and alkalinity control treatment, MES 100 by Floor Seal Technology, Inc. or equal.
 - 1) ASTM E96: <0.1 Perms.
 - 2) ASTM D1308: 14pH Resistant.
 - 3) ASTM D7234: 500+psi 100% concrete failure.
 - 4) ASTM F2170: 100%RH resistant.
 - 5) VOC Content: <100 g/L, meets SCAQMD Rule #1113.

6) ASTM F3010: Meets Requirements.

c. Self-leveling Compounds: Ardex Engineered Cements, K15, or V1200, Schonox ZM Rapid, US Self Leveler Armstrong, S-194, or equal.

H. Floor Hardener: Water soluble, inorganic, silicate-based curing, hardening, sealing and dustproofing compound. Aquaseal W20 by Monopole Inc., Kure-N-Harden by BASF, Chem Hard by L&M, Liqui-Hard by W. R. Meadows, or equal.

I. Underlayment: Two component latex underlayment for filling low spots in concrete for both interior and exterior applications, from featheredge to a maximum of 3/8 inch in thickness. Underlayment shall be non-shrink and suitable for repairing exposed concrete surfaces and for underlayment of carpet, resilient, tile and quarry floor coverings. La-O-Tex by TexRite, Underlay C, RS by Mer-Krete Systems, Underlayment 962 by C-Cure, or equal.

J. Vapor Barrier: Refer to Section 07 2600, Vapor Barriers.

K. Stair Treads and Nosings: Two part stair tread and nosing with ribbed abrasive bars. Fabricated from 6063-T5 or 6063-T6 extruded aluminum, mill finish. Anti-slip abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Color shall extend uniformly throughout filler.

1. American Safety Tread: TP-311R.

2. Balco Inc.: DST-330.

3. Nystrom: STTB-P3.375E.

4. Wooster Products Inc.: WP-RN3SG.

5. Equal.

L. Grout: ASTM C1107, non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 7 days; of consistency suitable for application and a 30 minute working time.

2.02 CONCRETE MIX

A. Mix shall be signed and sealed by a Civil or Structural Engineer currently registered in the State of California.

B. Strength of Concrete: Strengths and types of concretes shall be as indicated in the Drawings. Unless otherwise indicated or specified, concrete shall be provided with minimum 28-day strength of 3000 psi (f'c).

C. Concrete mix shall meet the durability requirements of ACI 318, Chapter 4.

- D. Concrete proportioning shall be determined on the basis of field experience and/or trial mixtures shall in accordance with ACI 318, Section 5.3. Proportions of materials shall provide workability and consistency to permit concrete to be placed readily into forms and around reinforcement under conditions of placement to be employed, without segregation or excessive bleeding.
- E. Ready-Mixed Concrete: Mix and deliver in accordance with requirements of ASTM C94.

PART 3 - EXECUTION

3.01 GENERAL

- A. Surfaces to receive concrete shall be free of debris, standing water, and any other deleterious substances before start of concrete placing.
- B. Time of Placing: Do not place concrete until reinforcement, conduits, outlet boxes, anchors, hangers, sleeves, bolts, and other embedded materials are securely fastened in place. Contact the Inspector at least 24 hours before placing concrete; do not place concrete until inspected by the Project Inspector.
- C. Pouring Record: A record shall be kept on the Project site of time and date of placing concrete in each portion of structure. Such record shall be maintained on the Project site until Substantial Completion and shall be available for examination by the ARCHITECT and DSA.

3.02 TOLERANCES

- A. Concrete construction tolerances shall be as specified in ACI 117 and as modified herein.
- B. Floor Flatness (F_F) and Floor Levelness (F_L) shall be as indicated below:

	Specified Overall Value		Minimum Local Value	
	F_F	F_L	F_F	F_L
Slabs on ground: mechanical and electrical rooms, parking structures and mortar bed set tile and quarry flooring.	20	15	15	10
Slab on ground: carpet.	25	20	17	15
Slab on ground: thinset tile and resilient flooring.	35	25	24	17

Suspended slabs: mechanical and electrical rooms, parking structures and mortar bed set tile and quarry flooring.	20	15	N/A	N/A
Suspended slabs: carpet.	25	20	N/A	N/A
Suspended slabs: thinset tile and resilient flooring.	35	20	N/A	N/A

- C. Refer to ACI 302.1R, Tables 8.1 and 8.2 Slab on Ground and Suspended Flatness/Levelness Construction Guide, for recommended concrete placing and finishing methods.
- D. Floor Flatness and Floor Levelness shall be tested in accordance to ASTM E1155. Floor measurements shall be made within 48 hours after slab installation, and shall precede removal of shores and forms.

3.03 PREPARATION

- A. For installation of vapor barrier refer to Section 07 2600, Vapor Barriers.
- B. Reglets and Rebates:
 - 1. Form reglets and rebates in concrete to receive flashing, frames and other equipment as detailed and required. Coordinate dimensions and locations required with other related Work.
 - 2. If concrete slabs on grade adjoin a wall or other perpendicular concrete surface, form a reglet in wall to receive and carry horizontal concrete Work. Reglet shall be full thickness of the slab and shall be 3/4 inch wide, unless otherwise indicated. Requirement does not apply to exterior walks, unless specifically indicated.
- C. Screeds: Install screeds accurately and maintain at required grade or slab elevations after steel reinforcement has been installed, but before starting to place concrete. Install screeds adjacent to walls and in parallel rows not to exceed 8 feet on centers.

3.04 INSTALLATION

- A. Conveying and Placing:
 - 1. Concrete shall be placed only under direct observation of the Project Inspector. Do not place concrete outside of regular working hours, unless the Inspector has been notified at least 48 hours in advance.
 - 2. Concrete shall be conveyed from mixer to location of final placement by methods that will prevent separation or loss of materials.

3. Concrete shall be placed as nearly as practicable to its final position to avoid segregation due to re-handling or flowing. No concrete that has partially hydrated or has been contaminated by foreign materials shall be placed, nor shall re-tempered concrete or concrete which has been remixed after initial set be placed.
4. In placing concrete in columns, walls or thin sections, provide openings in forms, elephant trunks, tremies or other recognized devices, to prevent segregation and accumulation of partially hydrated concrete on forms or metal reinforcement above level of concrete being placed. Such devices shall be installed so that concrete will be dropped vertically. Unconfined vertical drop of concrete from end of such devices to final placement surface shall not exceed 6 feet.
5. Concrete shall be placed as a continuous operation until placing of panel or section is completed. Top surfaces of vertically formed lifts shall be level.
6. Concrete shall be thoroughly consolidated by suitable means during placement, and shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms.
7. Where conditions make consolidation difficult or where reinforcement is congested, batches of mortar containing same proportions of cement, sand, and water as provided in the concrete, shall first be deposited in the forms to a depth of at least one inch.

B. Cold Weather:

1. Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather. All ground with which concrete is to come in contact shall be free from frost. No frozen materials or materials containing ice shall be used.
2. The temperature of concrete at the time of placement shall not be below the minimum temperatures given in Table 3.1 of ACI 306.1.
3. Concrete shall be maintained at a temperature of at least 50° F. for not less than 72 hours after placing or until it has thoroughly hardened. Cover concrete and provide sufficient heat as required. When necessary, aggregates shall be heated before mixing. Special precautions shall be taken for protection of transit-mixed concrete.

C. Hot Weather:

1. Concrete to be placed during hot weather shall comply with the requirements of ACI 318, Section 5.13.
2. Maintain concrete temperatures indicated in Table 2.1.5 of ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square feet of exposed concrete per hour.

3. Cool concrete using methods indicated in ACI 305R Appendix B.
 4. Place and cure concrete as specified in ACI 305R Chapter 4.
- D. Compaction and Screeding:
1. Tamp freshly placed concrete with a heavy tamper until at least 3/8 inch of mortar is brought to surface. Concrete shall then be tamped with a light tamper and screeded with a heavy straightedge until depressions and irregularities are eliminated, and surface is true to finish grades or elevations. Remove excess water and debris.
 2. Where slabs are to receive separate cement finish or mortar setting bed, continued tamping to raise mortar to surface is not performed. Laitance shall be removed by brushing with a stiff brush or by light sandblasting to expose clean top surface of coarse aggregate.
- E. Floating and Troweling:
1. When concrete has hydrated sufficiently, it shall be floated to a compact and smooth surface. After floating, wait until concrete has reached proper consistency before troweling. Top surfaces shall receive at least 2 troweling operations with steel hand trowel. Prior to and during final troweling, apply a fine mist of water frequently with an atomizing type fog sprayer. Omit troweling for slabs to receive a separate cement finish.
 2. For interior finish slabs, final troweling shall provide a hard, impervious, and non-slip surfaces, free from defects and blemishes. Finished surface shall be within tolerances indicated in Article 3.02. Avoid burnishing. Do not add cement or sand to absorb excess moisture.
 - a. Floor of Walk-In Refrigerator: Finish as specified above, to a smooth finish.
 - b. Floor of Gymnasium Locker Rooms: After floating, and while the surface is still plastic, provide a fine textured finish by drawing a fine fiber bristle broom uniformly over the surface in one direction only. Floors sloped for drainage should be brushed in the direction of flow.
 3. Vertical concrete surfaces shall be finished smooth and free from marks or other surface defects.

3.05 CURING

- A. Length of time, temperature and moisture conditions for curing concrete shall be in accordance with ACI 318, Section 5.11.

- B. Forms containing concrete, top of concrete between forms, and exposed concrete surfaces after removal of forms shall be maintained in a thoroughly wet condition for at least 7 consecutive days after placing.
- C. If weather is hot or surface has dried out, spray surface of concrete slabs and paving with fine mist of water, starting not later than 2 hours after final troweling and continuing until sunset. Surface of finish shall be kept continuously wet until curing medium has been installed.
- D. Immediately after finishing, monolithic floor slabs shall be covered with curing paper. Paper shall be lapped 4 inches at joints and sealed with waterproof sealer. Edges shall be cemented to finish. Repair or replace paper damaged during construction operations.
- E. When curing slabs with proactive water vapor emission and alkalinity control system:
 - 1. Coordinate and schedule application of curing compound with concrete pour schedule, while conforming to manufacturer's application instructions.
 - 2. When the surface of the concrete has hardened sufficiently to sustain foot traffic pre-cure slabs with liquefied product application following manufacturer's written instructions. Application shall be by trained applicators.
 - 3. Monitor Environmental Conditions: Set up weather station 20 to 30 inches above freshly placed concrete. Record temperature, humidity and wind velocity measurements at 15 minute maximum intervals.
 - 4. Calculate Evaporation Rate: Use recorded weather information in combination with nomograph per ACI 308R, Figure 4.1, Guide to Curing Concrete, to evaluate relevant evaporation rate.
 - 5. When the bleed water rate of the concrete is approximately equal to the surface water evaporation rate, spray curing compound material throughout surface of slabs and decks, following manufacturer's written instructions. Application shall be by trained applicators.
 - 6. Perform the following tests at least 28 days after placement of concrete and prior to floor covering installation. Submit to OAR test results indicating locations that do not comply with scheduled flooring installation requirements.
 - a. Calcium chloride testing per ASTM F1869.
 - b. Relative humidity testing per ASTM F2170.
 - c. Alkalinity testing per ASTM F710.
 - d. Perform concrete bond layer humidity meter testing to determine substrate surface acceptability.

7. Areas emitting moisture and alkalinity at rates exceeding floor covering manufacturer's published ASTM F1869 limits, shall receive a corrective coating, at no cost to the OWNER, as follows:
- a) Mask and protect adjacent walls and floor surfaces from effects of scarification and application of remedial treatment.
 - b) Scarify slab surface in area of application by shot blasting or other method acceptable to corrective coating manufacturer.
 - c) Prepare and fill cracks, control joints and cold joints.
 - d) Apply two-component modified epoxy penetrant and coating with roller and squeegee over required treatment area; saturate surfaces to ensure a through mechanical bond.
 - e) Clean and fill divots, chips, voids and other surface irregularities with one hundred percent Portland cement based patching compound or cementitious fill.
 - f) Apply cementitious surfacing over coating in areas to receive resilient and wood floor coverings to facilitate adhesion; apply to a thickness of 1/8 inch.

3.06 FILLING, LEVELING AND PATCHING

- A. Concrete slabs exhibiting high or low spots and indicated to receive resilient floor covering or soft floor covering, shall have surfaces repaired. High spots shall be honed, or ground with power-driven machines to required tolerances. Low spots shall be filled with latex underlayment, installed in strict accordance with manufacturer's written recommendations.
- B. Holes resulting from form ties or sleeve nuts shall be solidly packed, through exterior walls, by pressure grouting with cement grout, as specified. Grouted holes on exposed surfaces shall be screeded flush and finished to match adjoining surfaces.
- C. Cement Base: Cement base shall be of the height, thickness, and shape detailed. Base shall be reinforced with one inch mesh, 18 gage, zinc-coated wire fabric. Base finish mixture shall be one part Portland cement, 2 parts of fine aggregate and one part pea gravel. Colored cement base shall include a chemically inert mineral oxide pigment in the mix.

3.07 FINISHING

- A. Soda and Acid Wash: Concrete surfaces to receive plaster, paint or other finish, and which have been formed by oil coated forms, shall be scrubbed with a solution of 1-1/2 pounds of caustic soda to one gallon of water. Surfaces where smooth wood or waste

molds have been furnished shall be scrubbed with a solution of 20 percent muriatic acid. Wash with clean water after scrubbing.

- B. Sacking: Exposed concrete curbs, walls, and other surfaces shall be sacked by an application of Portland cement grout, floated, and rubbed. Sacking shall not be performed until patching and filling of holes has been completed. Entire sacking operation for any continuous area shall be started and completed within the same day.
1. Mix one part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having consistency of thick paint. Wet surface of concrete sufficiently to prevent absorption of water from grout. Apply grout uniformly with a brush or spray gun, then immediately float surface with a cork or other suitable float, scouring wall vigorously.
 2. While grout is still plastic, finish surface with a sponge-rubber float, removing excess grout. Allow surface to dry thoroughly, then rub vigorously with dry burlap to completely remove dried grout. No visible film or grout shall remain after rubbing with burlap.
- C. Sandblasting: Exterior concrete surfaces to receive stucco dash coat finish, where plywood or other smooth forms have been furnished, shall be uniformly sand-blasted with sharp quartz sand under sufficient air pressure to remove dirt, form oil and other foreign materials, and roughen surface to provide a proper bond. Such surfaces shall be thoroughly washed with clean water after sandblasting.
- D. Abrasive: Concrete stair treads, landings, ramps and steps on interior and exterior of buildings, and interior exposed concrete floors in shop buildings shall receive an abrasive finish.
- E. Floor Hardener: Exposed interior concrete floors throughout shall be treated with floor hardener.
1. Protect adjacent surfaces. Clean surfaces to receive treatment in accordance with manufacturer's instructions, ensuring that all stains, oil, grease, form release agents, laitance, dust and dirt are removed prior to application.
 2. Apply hardener in accordance with manufacturer's instructions as soon as concrete is firm enough to work on after final troweling.
- F. Cement Grout and Dry-Pack Concrete: Cement grout shall be mixed at the Project site and shall be composed of one volume of Portland cement and 2-1/2 volumes of fine aggregate. Materials shall be mixed dry with sufficient water added to make mixture flow under its own weight. When grout is used as a dry pack concrete, add sufficient water to provide a stiff mixture, which can be molded into a sphere.
- G. Broom Finish: Exterior stair treads and landings shall be provided with a non-slip broom finish in addition to abrasive finish specified.

- H. Abrasive Stair Nosing: Nosing shall be installed according to manufacturers written recommendations.

3.08 EXPANSION AND CONSTRUCTION JOINTS

- A. Construction Joints: Details and proposed location of construction joints shall be as indicated on the Drawings, located to least impair strength of structure, in accordance with the following:
 - 1. Thoroughly clean contact surface by sand blasting entire surface not earlier than 5 days after initial placement.
 - 2. A mix containing same proportion of sand and cement provided in concrete plus a maximum of 50 percent of coarse aggregate shall be placed to a depth of at least one inch on horizontal joints. Vertical joints shall be wetted and coated with a neat cement grout immediately before placing of new concrete.
 - 3. Should contact surface become coated with earth, sawdust, or deleterious material of any kind after being cleaned, entire surface shall be re-cleaned before applying mix.
- B. Expansion Joints: Provide expansion joints where indicated in walks and exterior slabs. Space approximately 20 feet apart, unless otherwise indicated. Joints shall extend entirely through slab with joint filler in one piece for width of walk or slab. Joint filler shall be 3/8 inch thick, unless otherwise indicated.
- C. Tooled Joints: Slabs, walks and paving shall be marked into areas as indicated with markings made with a V-grooving tool. Marks shall be round-edged, free from burrs or obstructions, with clean cut angles and shall be straight and true. Walks, if not indicated, shall be marked off into rectangles of not more than 12 square feet and shall have a center marking where more than 5 feet wide.

3.09 TESTING

- A. Molded Cylinder Tests:
 - 1. Inspector or testing lab personnel will prepare cylinders and perform slump tests. Samples for concrete strength shall be taken in accordance to ASTM C172. Each cylinder shall be dated, given a number, point in structure from which sample was obtained, mix design number, mix design strength and result of accompanying slump test noted.
 - 2. Separate tests of molded concrete cylinders obtained at same place and time shall be made at age of three days, seven days, and 28 days. A strength test shall be the average of the compressive strength of two cylinders, obtained from the same sample of concrete and tested at 28 days or at test age designated for determination of f_c .

3. Test cylinders shall be prepared at the Project site and stored in testing laboratory in accordance with ASTM C31, and tested in accordance with ASTM C39.
- B. Core Test: At request of the ARCHITECT, cores of hardened concrete shall be cut from portions of hydrated structures for testing, in accordance with CBC and ASTM C42.
1. Provide 4 inch diameter cores at representative places throughout the structure as designated by the ARCHITECT.
 2. In general, provide sufficient cores to represent concrete placed with at least one core for each 4,000 square feet of building area, and at least 3 cores total for each Project.
 3. Where cores have been removed, fill voids with drypack, and patch the finish to match the adjacent existing surfaces.
- C. Concrete Consistency: Measure consistency according to ASTM C143. Test twice each day or partial day's run of the mixer.
- D. Adjustment of Mix: If the strength of any grade of concrete for any portion of Work, as indicated by molded test cylinders, falls below minimum 28 days compressive strength specified or indicated, adjust mix design for remaining portion of construction so that resulting concrete meets minimum strength requirements.
- E. Air Content Testing: Measure in accordance to ASTM C173 or ASTM C231, for each composite sample taken in accordance to ASTM C172.
- F. Defective Concrete:
1. Should strength of any grade of concrete, for any portion of Work indicated by tests of molded cylinders and core tests, fall below minimum 28 days strength specified or indicated, concrete will be deemed defective Work and shall be replaced or adequately strengthened in a manner acceptable to the ARCHITECT and DSA.
 2. Concrete Work that is not formed as indicated, is not true within 1/250 of span, not true to intended alignment, not plumb or level where so intended, not true to intended grades and levels, contains sawdust shavings, wood or embedded debris, or does not fully conform to Contract provisions, shall be deemed to be defective Work and shall be removed and replaced.
- G. Concrete for Equipment Pads, Mechanical and Electrical Work: Unless otherwise indicated, strength shall have a minimum $f'_c = 3,000$ psi. Exposed concrete shall be provided with a hand trowel finish with radius corners and edges. Form and place concrete where necessary as described in Section 03 1000 Concrete Forming and Accessories, and reinforced as described in Section 03 2000 Concrete Reinforcing. Calcium chloride shall not be furnished in any concrete mix provided for the installation of underground electrical conduits. For concrete encasement of more than one conduit, furnish 3/4 inch maximum aggregate.

3.10 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.11 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

**TECHNICAL SPECIFICATIONS
FOR
MOORPARK COLLEGE ALTERATION TO STUDENT SERVICES ANNEX (A#33484) NEXT-UP**

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

00000	Title Page	01
00100	Table of Contents.....	04

DIVISION 1 – GENERAL REQUIREMENTS

01 1100	Summary of Work	04
01 1216	Phasing of the Work	04
01 2613	Request for Clarification	02
01 3113	Project Coordination.....	02
01 3119	Project Meetings	06
01 3300	Submittal Procedures.....	08
01 3546	Indoor Air Quality Procedures	12
01 4213	Abbreviations, Symbols & Acronyms	12
01 4523	Testing & Inspection	10
01 5000	Construction Facilities and Temporary Controls.....	16
01 7329	Cutting and Patching	07
01 7419	Construction and Demolition Waste Management	04

DIVISION 2 - DEMOLITION

02 4116	Demolition	04
---------	------------------	----

DIVISION 3 - CONCRETE

03 2000	Concrete Reinforcing	05
03 3000	Cast-In-Place Concrete.....	17

DIVISION 5 – METAL FABRICATIONS

05 4100	Structural Metal Stud.....	05
05 5000	Metal Fabrications	06

DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES

06 4000	Architectural Woodwork.....	09
06 8316	Fiberglass Reinforced Panels.....	03

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

07 4213	Metal Panels	11
07 2100	Thermal Insulation.....	05
07 2600	Vapor Barriers.....	04
07 2700	Plastic Sheet Air Barriers.....	05
07 6000	Flashing and Sheet Metal.....	04
07 9200	Joint Sealants.....	06

DIVISION 8 - OPENINGS

08 1113	Hollow Metal Doors and Frames	13
08 1416	Flush Wood Doors	07
08 3116	Access Panels and Frames	03

DIVISION 9 - FINISHES

09 0561	Moisture Testing for Flooring Installation.....	06
09 2216	Non-Structural Metal Framing.....	09
09 2900	Gypsum Board	11
09 5113	Acoustical Panel Ceilings.....	08
09 6513	Rubber Base.....	04
09 6813	Tile Carpeting.....	10
09 9000	Painting and Coating	09
09 9643	Epoxy Floor Coating	03

DIVISION 10 - SPECIALTIES

10 1400	Signage.....	12
10 2113	Plastic Toilet Compartments	06
10 2813	Toilet Accessories	04
10 4413	Fire Extinguishers Cabinets.....	04

DIVISION 11 – EQUIPMENT– NOT USED

DIVISION 12 - FURNISHINGS

12 2113	Window Blinds	03
---------	---------------------	----

DIVISION 13 – SPECIAL CONSTRUCTION – NOT USED

DIVISION 14 - CONVEYING SYSTEMSM – NOT USED

DIVISION 21 – FIRE SUPRESSION – NOT USED

DIVISION 22 – PLUMBING

22 0500	Common Work Results for Plumbing.....	06
22 0510	Plumbing Piping.....	10
22 0523	General Duty Valves for Plumbing Piping.....	06
22 0529	Hangers and Supports for Plumbing Piping and Equipment.....	10
22 0553	Identification for Plumbing Piping and Equipment.....	06
22 0700	Plumbing Insulation.....	09
22 0800	Commissioning of Plumbing.....	
22 4000	Plumbing Fixtures and Equipment.....	14
22 4216	Lavatory Decks and Faucets.....	06

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING

23 0500	Common Work results for HVAC.....	10
23 0513	Common Motor Requirements for HVAC Equipment.....	03
23 0519	Meters and Gages for HVAC Piping.....	06
23 0529	Hangers and Supports for HVAC Piping and Equipment.....	10
23 0548	Vibration and Seismic Controls for HVAC Piping and Equipment.....	
23 0553	Identification for HVAC Piping and Equipment.....	06
23 0593	Testing, Adjusting, and Balancing for HVAC.....	20
23 0700	HVAC Insulation.....	17
23 0900	Instrumentation and Control for HVAC.....	06
23 2113	Hydronic Piping.....	16
23 2123	Hydronic Pumps.....	04
23 2300	Refrigerant Piping.....	07
23 2500	HVAC Water Treatment.....	05
23 3113	Metal Ducts.....	17
23 3135	Fan Coils.....	04
23 3300	Air Duct Accessories.....	09
23 3400	HVAC Fans.....	
23 3713	Diffusers, Registers & Grilles.....	02
23 7400	Package Rooftop HVAC Equipment.....	
23 8140	Air to Water Unitary Heat Pump.....	

DIVISION 26 – ELECTRICAL

26 0000	General Provisions.....	11
26 0030	Tests and Identification.....	07
26 0050	Basic Electrical Materials & Methods.....	06
26 0060	Minot Electrical Demolition for Remodeling.....	03
26 0080	Tech Services Division Start-Up Service.....	20
26 0111	Conduits.....	05
26 0112	Plug-In Strips.....	02
26 0114	Cable Trays.....	03
26 0115	Wireways.....	01
26 0116	Wire Basket Cable Trays.....	04

26 0120	Conductors	04
26 0130	Electrical Boxes	04
26 0133	Terminal Cabinets	01
26 0140	Wiring Devices	09
26 0142	Nameplates and Warning Signs	02
26 0163	Distribution Panel Boards	02
26 0164	Branch Circuit Panel Boards	03
26 0170	Disconnects	02
26 0190	Support Devices	02
26 0585	Horizontal Boring System	03
26 2450	Grounding	06
26 2480	Motor Starting Equipment & Wiring	05
26 2510	Lighting Fixtures New	03
26 4721	Fire Alarm System New	33
26 4745	Networking and Data Communications	17
26 4750	Cabling and Distribution System	46
26 4901	General Control Devices	03
26 4920	Motor Control	04

DIVISION 31 – EARTHWORK

31 1000	Site Clearing	03
31 2000	Earthwork	06

DIVISION 32 – SITE WORK

32 1123	Aggregate Base Courses	02
32 1215	Asphalt Concrete Paving	04
32 1600	Curbs, Gutters, Sidewalks	04
32 1723	Pavement Markings	02

DIVISION 33 – UNDERGROUND UTILITIES

33 1000	Water Utilities	01
33 3000	Sanitary Sewerage Utilities	04
33 4000	Storm Drainage Utilities	04
33 4600	Subdrainage	05

APPENDIX

Asbestos & Lead-Based Paint Survey Report	48
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END OF TABLE OF CONTENTS

SECTION 05 4100

STRUCTURAL METAL STUD FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Cold formed metal framing for exterior framing, load bearing and curtainwall.

B. Related Requirements:

1. Division 01 - General Requirements.

1.02 SUBMITTALS

- A. Shop Drawings: Submit drawings showing framing, connection details, accessories and anchorage. Indicate location of assemblies, size and spacing of framing components.

- B. Product Data: Submit manufacturer's catalog data for each item proposed for installation.

- C. Certificates: Furnish manufacturer's certification that materials meet or exceed Specification requirements.

1.03 QUALITY ASSURANCE

A. Comply with the following requirements:

1. AISI S100 - Specifications for Design of Cold Formed Steel Structural Members.
2. Welds shall be performed by AWS certified welders. Welding shall be performed in accordance with requirements of American Welding Society (AWS) Structural Welding Code-Steel D1.1 and D1.3. Structural welding Code-Sheet Steel.
3. Welding shall be inspected by a special inspector, approved by DSA to inspect Work of this section. The Project Inspector shall be responsible for monitoring work of special inspector to ensure that inspection program is satisfactorily completed.
4. Manufacturer shall be a member of the Steel Framing Industry Association (SFIA) or the Steel Stud Manufacturers Association (SSMA).

1.04 REFERENCES

A. ASTM International:

1. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by Hot Dip Process.
2. ASTM A924 – Standard Specification for General Requirements for Steel Sheet Metallic-Coated by Hot-Dip Process.
3. ASTM A1003 – Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
4. ASTM A1008 – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.
5. ASTM C954 – Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
6. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members.
7. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
8. ASTM E488 – Standard Test Methods for Strength of Anchors in Concrete Elements. .
9. ASTM E1190 – Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members.

- B. Tolerances: Install walls and partitions on straight lines, plumb, free of twists or other defects, and contacting a 10-foot straight edge for its entire length at any location within a 1/8 inch tolerance. Install horizontal framing level within a tolerance of 1/8 inch in 12 feet in any direction.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered in their original unopened packages and stored protected from damage. Do not store material directly on grade. Provide adequate support to prevent bowing of material prior to installation.
- B. Store welding electrodes in accordance with AWS D12.1.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Provide studs, tracks, joists, header, and accessories manufactured by one of following:
 - 1. ClarkDietrich.
 - 2. Or Equal.
- B. Special Connection Accessories: Products manufactured by The Steel Network, Inc., ClarkDietrich or equal.

2.02 MATERIALS

- A. Studs, tracks, slotted deflection tracks, furring channels, u-channels, z furring, angles, straps, clips, web stiffeners and miscellaneous members and accessories shall conform to the following:
 - 1. Metal framing shall be formed from corrosion resistant-steel conforming to requirements of ASTM A653, 50 ksi minimum for 16 gauge and heavier and 33 ksi minimum for 18 gauge and lighter.
 - 2. Protective Coating: G60 minimum per AISI S240 and ASTM C955.
 - 3. Metal framing shall be manufactured in conformance to ASTM C955 or AISI S200.
- B. Gauges and properties of studs shall be as indicated on Drawings.
- C. Mechanical anchors to concrete and masonry shall be metal cinch at least 3/8 inch in diameter threaded bolt head type. Anchor bolts to be installed in concrete shall be hook type 1/2 inch diameter or more. Unless otherwise indicated.
- D. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws. Use low-profile head beneath sheathing and gypsum board.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General Erection Requirements:
 - 1. Install cold-formed framing in accordance with requirements of ASTM C1007.
 - 2. Install in compliance with applicable sections of the AISI Standard for Cold-Formed Steel Framing General Provisions.
 - 3. Welds shall conform to AWS D.1.3.
- B. Examine structure, substrates and installation conditions. Do not proceed with metal stud framing installation until unsatisfactory conditions have been corrected.

- C. Install plumb and true. Install necessary accessories for proper installation.
 - D. Anchor top and bottom runner track to structure overhead and to floor structure below.
 - E. Install studs squarely in top and bottom runner track with firm abutment against track webs.
 - F. Align and plumb studs and fasten to flanges of both top and bottom runner tracks.
 - G. Provide three studs minimum at corners of stud walls. Locate so as to provide surfaces for attachment of interior and exterior facing materials.
 - H. Members not indicated to be welded together shall be attached with manufacturer recommended screws with minimum one screw at each flange of stud to top and bottom track.
 - I. Wire tying of framing members is not permitted.
 - J. Provide lateral bracing and bridging in accordance with manufacturer's written recommendations or as required by CBC.
 - K. Intersecting walls and partitions, whether load bearing or not, shall be connected.
 - L. Splices in axially loaded studs are not permitted.
 - M. Splice or butt weld butt joints in runner tracks. No splices are permitted in tracks over lintels, diaphragm sheathing, or diagonal bracing.
 - N. Weld connections by fillet welds or plug welds in accordance with AWS recommended procedures and practices.
 - O. Touch-up field abrasions and welds with galvanizing touch-up material.
- Studs that frame door openings shall be clipped to floor with 14 gage angle clips. Each clip to have two fasteners into studs and two fasteners into floor.
- P. Provide additional joists or blocking adjacent to exterior and interior walls, openings and elsewhere as required to provide support for indicated ceiling construction.
 - Q. Provide an additional joist under parallel partitions where partition length exceeds $\frac{1}{2}$ joist span and around floor and roof openings which interrupt one or more spanning members.

3.02 CONNECTIONS TO METAL DECKING

- A. Provide premolded neoprene filler strips matching flute profile for non-fire-rated walls and partitions covered on one or both sides up to metal decking.
- B. Fire-rated top tracks shall be installed in accordance with manufacturer's recommendations and fire rating approval requirements.

3.03 QUALITY CONTROL

A. Welding Inspection:

1. Inspection of field welding operations shall be performed by special inspector.
2. The special inspector shall inspect material, equipment, procedures, welds, and welder qualifications.

3.04 CLEAN UP

- A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.05 PROTECTION

- A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Metal fabrications:

1. Steel pipe.
2. Square and rectangular steel tubing.
3. Pipe columns.
4. Steel stairs.
5. Handrails and guardrails.
6. Steel thresholds.
7. Steel ladders.
8. Steel Gates.
9. Gratings, frames and covers.
10. Miscellaneous fabrications, as indicated on the Drawings.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4523: Testing and Inspection.
3. Section 05 1200: Structural Steel Framing.
4. Section 08 7100: Door Hardware.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating provided materials, dimensions, anchoring detail, and details of termination or connection to adjacent construction. Indicate items that are purchased from a manufacturer and items that are shop fabricated. Indicate component parts requiring Project site fabrication or assembly.
- B. Product Data: Submit Product Data for manufactured items. Submit Product Data for primers and finishes.
- C. Material Samples: Submit Samples of primers and finishes on fabricated items.

- D. Installation Instructions: Submit installation instructions for manufactured items.

1.03 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement:
 1. Design, fabricate, and install miscellaneous metals in accordance with AISC - Design, Fabrication, and Erection of Structural Steel for Buildings.
 2. AWS D-1.1 Code - Welding in Building Construction.
 3. Inspection of Welding: Refer to Section 01 4523: Testing and Inspection.
 4. Welding: Refer to Section 01 4523 Testing and Inspection.
- B. Coordinate installation of accessory items required for metal fabrications.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Store miscellaneous metal items above grade on platforms, skids, or other required supports.
- B. Protect from corrosion or damage.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Structural Steel Shapes: ASTM A36.
- B. Steel Pipe:
 1. Steel pipe for pipe columns and other structural purposes shall conform to ASTM A53, Type E or S, Grade B, as required.
 2. Steel pipe other than pipe furnished for structural purposes shall conform to ASTM A53.
- C. Square and Rectangular Steel Tubing:
 1. Steel tubing for structural purposes shall be carbon steel conforming to ASTM A500.
 2. Steel tubing other than tubing furnished for structural purposes shall be hot or cold rolled carbon steel electric welded tubing.
- D. Cast Steel: ASTM A27, Grade 65-35.
- E. Steel Bolts: ASTM A307, Grade A, with bolt head and nut dimensions conforming to ANSI B 18.2.1.
- F. Rolled Steel Plates and Shapes:

1. Shapes and plates shall conform to ASTM A36, except for plates to be bent or cold-formed.
2. Plates to be bent or cold-formed shall conform to ASTM A283, Grade C.

G. Chain: Chain shall be 4/0 double loop pattern coil chain.

H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications "Rapid set Cement".

2.02 FABRICATION

A. General:

1. For fabrication of Work exposed to view, provide only materials smooth and free of blemishes. Remove blemishes by grinding or by welding and grinding, before cleaning, treating, and installation of surface finishes including zinc coatings.
2. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated or specified.

E. Ladder Extensions: Where vertical ladders are installed for access to roof hatches, provide the following:

1. Roof hatch ladders shall be provided with ladder extensions. Ladder extensions shall be Bilco Model 1, "LadderUP Safety Post," Maxam Metal Products, "Spring Balance Safety Post", or equal, on fixed ladders below roof hatches. Device shall be manufactured of high strength steel with telescoping tubular section that locks automatically when fully extended. Upward and downward movement shall be controlled by a stainless steel spring balancing mechanism. Finish shall hot dip galvanized. Unit shall be completely assembled with fasteners for securing to the ladder rungs in accordance with the manufacturer's instructions.

F. Miscellaneous Framing and Supports:

1. Except as otherwise indicated, space anchors 2 feet on center, and provide minimum anchor units of 1 ¼-inch by ¼ inch by 8-inch steel straps.
2. Shelf angles for exterior construction shall be galvanized steel of sizes indicated.

G. Welding:

1. Weld connections unless otherwise indicated.
2. Weld corners and seams continuously and in accordance with requirements of AWS Code. Welds shall be inspected as required in Section 05 1200: Structural Steel Framing.

3. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

H. Galvanizing:

1. ASTM A123, ASTM A153, or ASTM A386, as applicable, hot dip with 2.0 ounces per square foot on actual surface and 1.8 ounces per square foot minimum on any specimen, and as specified herein.
2. Galvanizing Repair Material: DRYGALV as manufactured by the American Solder and Flux Company, Galvalloy, Galvion, or equal. Hot applied repair material, or anodic zinc- rich galvanizing repair paint conforming to Mil Spec DOD-P-21035.
3. Items to be galvanized shall be hot-dip galvanized in sections as large as possible.

I. Shop Finish:

1. Metal fabrications shall be provided with a coat of primer, except those indicated to be completed with exposed galvanized finish.
2. Primers:
 - a. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
 - b. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
 - c. Minimum dry film thickness of primer shall be 2.0 mils.
3. Preparation for Primer Painting: Miscellaneous ferrous metal, except items specified galvanized, shall be thoroughly cleaned and prepared for painting, including removal of shipping oils or protective coatings, mill scale, grease, dirt and rust. Prepare in accordance with SSPC recommendations. Deliver to Project site primed or galvanized as indicated, and ready to receive Project site applied finishes.
4. Galvanized Metal Work to receive Paint: Clean oil, grease and other foreign materials from surfaces. Apply vinyl wash pretreatment coating. Follow manufacturer's instructions for drying time, and then prime with one coat of metal primer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Handrails and Guardrails:

1. Install standards into metal sleeves cast in concrete, and extending into it at least 9 inches. Wedge standards true, plumb, and fastened by packing with grout. Finish grout smooth and flush with adjacent surfaces.
 2. Rails contacting a vertical surface shall be fitted with standard pipe rail flanges, secured to concrete or masonry surfaces with 3/8 inch 2-unit cinch anchor bolts and secured to wood frame surfaces with 3/8 inch lag screws, unless otherwise indicated.
 3. Railings abutting pipe columns shall be provided with shaped end caps to fit columns welded to rails, and secured to columns with self-tapping machine screws.
- B. Steel Thresholds: Fabricate channel or angle thresholds of rolled steel sections of size indicated, galvanized after fabrication. Anchor into concrete with countersunk 2-unit cinch anchor bolts, unless otherwise indicated.
- C. Steel Ladders: Provide at locations indicated, fabricated as detailed. Ladders shall be anchored to concrete or masonry with 1/2 inch cinch anchor bolts. Ladders secured to a wood framed wall shall be anchored with 1/2 inch lag screws. Provide provisions for anchoring ladders before lath is applied to plastered walls.
- D. Gratings, Frames and Covers:
1. Over areas indicated, provide steel gratings and grating frames as detailed. Frames shall have mitered and welded corners, and be fitted with anchors.
 2. Provide steel checkered plate covers and steel frames for sumps, grease traps, and sand traps, and other covers for access where indicated. Frames shall be provided with mitered and welded corners and be fitted with anchors as detailed. Cover shall be perforated. Each section of access cover shall be furnished with steel pull rings and tool operated fastening device. Screws to fasten covers shall be brass.

3.02 ADJUSTING

- A. Touch Up Damaged Surfaces:
1. Shop Painted Finishes: Comply with SSPC-PA-1 for touch-up; apply with brush to produce a minimum 2.0 mil dry film thickness.
 2. Galvanized Surfaces: Clean field welds, connections and damaged areas. Repair galvanized finishes in accord with ASTM A780.

3.03 CLEAN UP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.04 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 06 1643
GYPSUM SHEATHING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Fiberglass-mat faced, moisture and mold resistant exterior gypsum sheathing.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 05 4100 - Structural Metal Stud Framing.
 - 3. Section 07 2100 Thermal Insulation.
 - 4. Section 07 9200 - Joint Sealants.
 - 5. Section 07 2700 Plastic Sheet Air Barriers.

1.02 PROJECT REQUIREMENTS

- A. Design Requirements: Provide systems capable of resisting deflection.
- B. Regulatory Requirements: Comply with CBC requirements for design and installation.

1.03 SUBMITTALS

- A. Material Samples: Submit 5.5" inch by 8.5" inch sample of the exterior sheathing panel. Submit 5 screws to be utilized in attaching the exterior sheathing panel.
- B. Product Data: Submit manufacturer's catalog data for the sheathing product and the attachment screws.

1.04 QUALITY ASSURANCE

- A. Comply with following as a minimum requirement:
 - 1. ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - 2. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - 3. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.

4. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
 5. Gypsum Association (GA): GA-253 Application of Gypsum Sheathing.
- B. Qualifications: Installer shall have a minimum 5 years experience in installing and finishing gypsum board.
- A. CHPS Low-Emitting Materials table: Materials submitted shall meet the CHPS Low-Emitting criteria and be listed as Low-Emitting on the following web site: www.CHPS.net or be listed on UL website Greenguard.org as Greenguard Gold Certified.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original, factory sealed packages, containers or bundles bearing brand name and name of manufacturer.
- B. Materials shall be kept dry. Exterior Sheathing shall be neatly stacked flat; avoid sagging and damage to edges, ends, and surfaces.
- C. Fire-rated materials shall have fire classifications numbers attached and legible.
- D. Provide all means necessary to protect Exterior Sheathing systems before, during, and after installation.
- E. Exterior sheathing showing any evidence of water damage shall not be installed. Exterior sheathing showing evidence of water damage after installation shall be removed and replaced.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS AND PRODUCTS

- A. Georgia-Pacific - Dens Glass Gold sheathing.
- B. National Gypsum Co. - Gold Bond eXP sheathing.
- C. U.S. Gypsum Co. - SECUROCK brand UltraLight glass Mat.
- D. Or equal .

2.02 MATERIALS

- A. Exterior sheathing Type X (fire-resistant): 5/8 inch thick, 4-foot wide and up to 10 feet long conforming to ASTM C1177.
 1. Edges: Square.
 2. Surfacing: Fiberglass mat on face, back, and long edges.
 3. Mold Resistance: score of 10 per ASTM D3273 in a test as manufactured.

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2.03 ACCESSORIES

- A. Fasteners: ASTM C1002, corrosion resistance of more than 800 hours per ASTM B117. In coastal environments or aggressive environments, stainless steel fasteners shall be used.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install in accordance with the fire rated assembly indicated on the drawings, GA-253, ASTM C1280 and the manufacturer's recommendations.
- B. Prior to application of exterior system, attachment of sheathing to framing shall be able to withstand design wind loads of building.

3.06 CLEAN-UP

- A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.07 PROTECTION

- A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 06 4000
ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Architectural woodwork, casework, trim, hardware, countertops, and shelving as indicated on Drawings.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 06 1000: Rough Carpentry.
3. Section 08 8000: Glazing.
4. Section 09 9000: Painting and Coating.
5. Section 10 1100: Visual Display Units.
6. Section 22 1000: Plumbing.

1.02 DEFINITIONS

- A. "Sustainably managed" is defined as "forests that are being managed through a professionally administered forestry management plan in which timber growth equals or exceeds harvesting rates in both quantity and quality, protecting rivers and streams from degradation, minimizing damage to the forest when harvesting and promoting biodiversity".

1.03 SYSTEM DESCRIPTION

- A. Design Requirements: Provide wood products from certified sustainably harvested sources.

1.04 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings of casework indicating materials and hardware, details of construction, dimensions, methods of fastening and installation details. Shop Drawings shall bear a Woodwork Institute (WI) Certified Compliance Label indicating that Shop Drawings fully meet requirements of the North American Architectural Woodwork Standards (NAAWS) grade or grades specified. Shop Drawings shall indicate grounds, backing, blocking, sleepers and other items required for installation of casework, which are

to be provided and installed as part of the Work.

- B. Certificates: Provide a WI Certified Compliance Certificate certifying that materials, fabrication and installation will comply with the specified requirements.
- C. Material Samples: Submit 2-inch by 3-inch plastic laminate and solid surfaces color Samples of manufacturer's entire color range.
- D. Submit manufacturer's product data for adhesives and finishes. Indicate VOC limits of the product. Submit MSDS highlighting VOC limits.
- E. Closeout Submittals: Provide a WI Certified Compliance Certificate for Installation.

1.05 QUALITY ASSURANCE

- A. Comply with the North American Architectural Woodwork Standards (NAAWS), latest edition, published jointly by the Architectural Woodwork Manufacturer's Association of Canada and the Woodwork Institute of California, grades as specified herein.
- B. Each elevation of casework shall bear a WI Certified Compliance Label indicating that casework fully meets requirements of the AWS grade specified.
- C. Each plastic laminate countertop and/or solid surface top shall bear a WI Certified Compliance Label indicating tops fully meet requirements of the AWS grade specified.
- D. Mock-ups: When required by the Architect, submit a full-scale base cabinet, countertop, and wall-hung cabinet, illustrating joinery and plastic laminate finish. Base cabinet shall incorporate a drawer, an adjustable shelf, and a door. Wall-hung cabinet shall incorporate two doors, one adjustable shelf and finished end, including required hardware.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered to the Project site in undamaged condition, stored in fully covered, well ventilated areas, and protected from extreme changes in humidity and temperature. Refer to the North American Architectural Woodwork Standards (NAAWS) for recommended care and storage.
- B. In event of damage immediately furnish necessary repairs or replacements.

1.07 PROJECT CONDITIONS

- A. Store indoors, in ventilated areas with constant but minimum temperature of 60 degrees F. and maximum relative humidity of 25 percent to 55 percent. Do not install casework until building is enclosed and ambient conditions are within the temperature and humidity range to be expected during occupancy. Acclimatize materials to the installation temperature and humidity for at least 72 hours prior to installation. Maintain conditions until Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Plastic Laminate Faced Cabinets:

1. Plastic laminate: High pressure plastic laminate conforming to NEMA standard LD-3; Grade HGS 0.048 inches at horizontal surfaces, Grade VGS 0.028 inches at exposed vertical surfaces and edge bands, and HGP 0.039 inch minimum for post-formed countertops.
2. Particle Board Core Material: 45 lb. density, conforming to ANSI A208.1, Table 1, Grade 1-M-2.
3. Solid Lumber:
 - a. Solid lumber for exposed members, drawers, trays and special details shall be Clear birch or maple.
 - b. Unexposed solid lumber for concealed webs or structural members shall be of Douglas Fir., alder or birch.
4. Softwood Plywood: Rotary cut exterior type A-C grade softwood plywood complying with PS1.
5. Hardboard: Factory finished pressure sealed hardboard conforming to the requirements of PS 58. Oil tempered hardboard shall conform to CS 251.
6. Cabinet Liner: Semi-exposed surfaces shall be finished with 0.020 inch high-pressure laminate cabinet liner, conforming to NEMA Standard LD-3.
7. Edge Banding: One of the following.
 - a. T-type extruded tenite-butyrate 1/16 inch minimum thickness, with serrated leg 3/8 inch in length. Use only when matching existing.
 - b. 0.028 inch minimum thickness plastic laminate.
 - c. PVC, 0.6 mm at cabinet sides, top, bottom divisions and shelves, 3 mm at doors, drawer fronts and false fronts.
8. Glass Doors: 1/4 inch laminated safety glass.
9. Adhesive: Type II water-resistant, rigid type glue of formula conforming to PS 51.
10. Sealer: Thompson Water Seal 101, Watco Oil, Zinsser, or equal.
11. Base: Cover toe spaces with typical wall base unless otherwise indicated.

B. Wood Casework:

1. Sheets:
 - a. Medium Density Fiberboard (MDF): ANSI A208.2.
 - b. Medium Density Overlay (MDO): APA PS-1.
 - c. Hardwood Plywood: ANSI/HPVA – HP-1.
2. Edge Banding: Same species of wood as adjacent to exposed surfaces.

C. Countertops:

1. Solid Surfaces: Filled cast polymeric resin panel, with homogeneous composition throughout its thickness.
 - a. Corian.
 - b. Formica.
 - c. Wilsonart.
 - d. Equal.

D. Hardware:

1. Drawer Slides for Custom Grade Cabinetry:
 - a. Pencil drawers: Full extension type: Accuride 2006, Blum, Hafele, or equal.
 - b. Drawers and box drawers, up to 24 inches wide: Accuride 3832E, Blum, Hafele, or equal.
 - c. Lateral file drawers, up to 30 inches wide: Accuride 4034 overtravel or 4033 equal travel, Blum, Hafele, or equal.
 - d. Lateral file drawers, more than 30 inches wide: Accuride 3640, Blum, Hafele, or equal.
2. Drawer Slides for Premium Grade Cabinetry:
 - a. Pencil drawers: Full extension type: Accuride 2632, Blum, Hafele, or equal.
 - b. Drawers and box drawers, up to 24 inches wide: Accuride 7432, Blum, Hafele, or equal.
 - c. Lateral file drawers, up to 30 inches wide: Accuride 4034 overtravel or 4033 equal travel, Blum, Hafele, or equal.

- d. Lateral file drawers, more than 30 inches wide: Accuride 3641, Blum, Hafele, or equal.
3. Flipper Door Slides for Premium and Custom Grade Cabinetry:
 - a. For vertically mounted retracting cabinet doors up to 75 pounds and 72 inches tall: Accuride 1432, Blum, Hafele, or equal, with hinge carrier strip.
4. Door Mutes: Rubber, approximately 1/4 inch diameter, colors to match adjacent finish.
5. Plastic Grommets: Doug Mockett, Alliance Express, Rockler, or equal; color as selected by Architect.
6. Adjustable Shelves with Clips: Adjustable shelf supports (EDP type, unless otherwise noted) set in 5 mm holes spaced 32 mm on center:
 - a. Hafele America, Co., No. 282.04.711, Blum, Hettich, or equal.
 - b. Hafele America, Co., No. 282.24.13, Blum, Hettich, or equal.
7. Hinges: Five-knuckle overlay hinge with hospital tip - Rockford 376, or equal.
8. Cabinet Locks:
 - a. Door Locks: Pin tumbler type – CompX National No. C8173, Olympus 100DR x 12-1 strike, CCL Security Products, or equal.
 - b. Locks for Sliding Doors: National No. C8142 x thimble strike, Olympus 300 SD x thimble strike, CCL Security Products, or equal.
 - c. Drawer Locks: CompX National C8179brass strike, Olympus 200 DW x 12-1 strike, CCL Security Products, or equal.
 - d. Cabinet locks shall be flush with surface of door and protrude no greater than 3/16 inch.
9. Top-hung Hardware Assembly for Sliding Doors: Grant No. 6064, Hafele, Blum, or equal.
10. Track for Sliding Doors: K & V 455 x or 455.55, Hafele, Blum, or equal.
11. Pull Flush Ring at Drawers behind Doors: Safe No. 6116, Trimco 24, Quality, or equal.
12. Pulls: Quality No. 179 x 180, Trimco No. 553P, Hafele, or equal.
13. Catches: Magnetic type - Epco No. 592, Lawrence No. SC1364-AL, or equal.

14. Four-way Tension Catch: Glynn-Johnson GJ21A, Trimco, Quality, or equal.
15. Noiseless Catch:
16. Elbow Catch: Schlage SP2A3, or equal.
17. Bolts: Surface type, Quality B6, Trimco No. 4856-6, or equal.
18. Brackets and Shelf Strip for Glass Shelves: K & V No. 80 x 180, Garcy 604 x 686, or equal.
19. Shelf Standards and Brackets: K & V No. 255 x 256, line bored holes for pins as approved by AWI Standards Stanley No. 798 x 799, steel zinc plated, or equal.
20. Card Holders for Drawers: Corbin No. 1913-1/4H, Garcy No. 853, or equal.
21. Hanger Rods: 1-1/16 inches minimum diameter metal tubing, aluminum or stainless steel clad, KV660; heavy wall steel tubing KV770, Stanley, or equal.
22. Hanger Rod Flanges: KV757, or flanges KV734, KV735; Ronther Reiss R44-55; or equal.
23. Hardware Finish: With exception of finish hardware items which have finishes specified, hardware shall be furnished with dull chrome US 26D or dull stainless steel US 32D finish.
24. Keying:
 - a. Key locks inside one room alike. Furnish three keys for each lock keyed separately, and 2 keys for each lock in keyed alike groups. Master keys shall be tagged and delivered to the Inspector. Locks and keys shall be stamped with coded set number / direct digit.
 - b. Master keys shall be National GM2.

2.02 FABRICATION

- A. Plastic Laminated Casework: Construction of plastic laminated casework shall conform to the material and construction requirements for North American Architectural Woodwork Standards Custom grade, flush overlay construction, except, modified as follows:
 1. Exposed Exterior surfaces shall be High Pressure Decorative Laminate grade VGS.
 - a. Edge Band: PVC 1 mm. for cabinet body and 3 mm. at doors and drawer fronts.
 2. Exposed Interior surfaces: Interior surfaces of open cabinets shall be laminated to match exteriors. Cabinets with glass doors shall use cabinet liner grade CLS.

3. Semi-exposed Surfaces: Shall be cabinet liner grade CLS and edges of panels shall be edge banded per 2.01 A.
4. Cabinet bases may be integral or separate. Bases shall be 3/4 inch thick plywood securely jointed at four corners to a supporting block 1 1/2-inch thick.
5. Adjustable shelving shall be 3/4 inch thickness particleboard for spans up to 25 inches and one inch thickness for spans over 25 inches up to 34 inches. Adjustable shelving over 34 inches in span shall be one inch thick plywood core with 0.020 inch cabinet liner grade CLS both sides. Shelving hardware shall be adjustable to 1 1/4 inch centers. Faces of shelving shall be finished with 0.020 inch thickness cabinet liner grade CLS both sides.
6. Drawers:
 - a. Drawers shall be of dovetail or dowel construction. Sides, backs and sub-fronts shall be made of 1/2 inch thick clear birch or maple solid stock, or 9 ply plywood without knots or interior voids. Drawer bottoms shall be in accordance with AWI requirements, glued and nailed.
 - b. Drawers shall be fitted with ball bearing slides accurately installed for smooth drawer operation.
 - c. Drawer fronts shall be of 3/4 inch thick plastic laminate construction, fully edge-banded with plastic laminate T-banding to be used when matching existing. T-banding joint shall occur at center of bottom edge of panel.
7. Doors:
 - a. Doors shall be of flush overlay type. Doors shall be fully edge-banded. Doors of cabinets within any group of adjacent units shall be in alignment.
 - b. Wrap around hinges shall be routed into edge of door.
8. Back Priming: Seal unfinished materials installed for backs, bases, self-edge backing, stripping and other concealed portions with a water-repellent sealer.
9. Banding:
 - a. Edge banding shall be accurately fitted. Where edge band joins plastic surfaces, there shall be no open spaces, voids, or chipping of plastic laminate surface.
 - b. Exposed cabinet surfaces shall be flush, and any protruding edges of banding shall be machined or trimmed to provide a flat smooth corner at intersection of banding and adjoining surfaces. Plastic laminate edge banding shall be installed on tops, webs, bottoms, ends, and inside partitions. T banding may only be installed on drawer fronts and door edges and when required to match

existing.

C. Countertops:

10. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
 - a. Manufacturers:
 1. Avonite Surfaces.
 2. E. I. du Pont de Nemours and Company.
 3. Formica Corporation.
 4. Wilsonart International.
 5. Equal.
 - b. Type: Provide Standard Type.
 - c. Integral Sink Bowls: Comply with ISSFA-2 and ANSI Z124.3, Type 5 or Type 6, without a precoated finish.
 - d. Colors and Patterns: As selected by Architect from manufacturer's full range.
 - e. Butt splash or seamless (coved) backsplash.
 - f. Provide drip groove.

2.03 FINISHING

- A. Wood casework and wood components of laminated plastic casework shall be factory finished. Exposed surfaces shall be finished with one coat of lacquer sealer and 2 coats of finish lacquer. Unexposed materials such as backs, webs, back of tops, and the like, shall be sealed with one oil base prime coat. Semi-exposed wood surfaces such as drawers shall be finished with one coat of sanding sealer and one coat of clear gloss lacquer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install Work of this section as specified in the North American Architectural Woodwork Standards (NAAWS), grade to match the grade of the work to be installed.
- B. Cabinets: Install cabinets level, plumb, and secure to walls. Exposed screws shall have finish washers.

- C. End Panels and Fillers: Furnish to match exposed surfaces and accurately scribe to walls and neatly and securely fit to cabinets.
- D. Completion: Upon completion of installation, cabinets including drawers and shelves shall be cleaned. Doors and drawers shall operate easily and freely.
- E. Scribe plastic laminated cabinets to walls. Installation of surface-applied moldings is not permitted.
- F. Coordinate sink and penetration locations with 22 1000 Plumbing.
- G. Install solid surface countertops per NAAWS custom grade.

3.02 CLEAN UP

- A. Remove debris, rubbish and waste material and legally dispose of off the Project site.

3.03 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 06 8316

FIBERGLASS REINFORCED PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fiberglass reinforced plastic panels and accessories.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 09 2900 - Gypsum Board.

1.02 PROJECT REQUIREMENTS

- A. Fiberglass reinforced plastic panels and accessories for service areas as indicated on the Drawings.

1.03 SUBMITTALS

- A. Shop Drawings: Indicate location and dimension of joints and fastener attachments
- B. Samples: Submit 8 inch by 10 inch sample of each type, color, and accessories to be installed.
- C. Certificate of Compliance: Submit certificate from manufacturer the installed wall surfacing meets Specification requirements.

1.04 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Class A Interior Finish Material as defined by the National Fire Protection Association Life Safety Code 101.
2. Underwriters Laboratories, Inc. listed, in accordance with ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
3. USDA/FSIS Requirements.
4. FMRC (Factory Material Research Center) approved.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's cartons properly labeled and identified.
- B. Store materials flat in a clean, dry storage area where temperature shall be maintained above 50 degrees F. Do not store rolls on end.

1.06 PROJECT CONDITIONS

- A. Installation environment shall be stable and controlled.
- B. Room temperature shall be controlled to 75 degrees F plus or minus 5 degrees, during and after installation.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Wall and/or ceiling panels: Crane Composites, Fire-X Glasbord FM with Surfaseal, , Marlite FRP Panel P-100 Class A, Panolam Industries International Inc., or equal.
 - 1. Wall Panels: Class 1 (A) Interior Finish. Thickness to be .09 inch, embossed, color as selected by Architect.
 - 2. Class A Flame Spread: Less than 25, with Smoke Developed less than 450, per ASTM E84.
 - 3. Barcol Hardness scratch resistance: 39 as per ASTM D2583, Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
 - 4. IZOD Impact per ASTM D256: 11.
- B. Stainless steel trim. Provide inside corner and outside corners, panel division and edge trim.
- C. Adhesive and Sealants: VOC compliant, as recommended by manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine backup surfaces to determine corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.
- B. Do not begin installation until backup surfaces are in satisfactory condition.

3.02 APPLICATION

- A. Perform cutting with carbide tipped saw blades or drill bits, or cut with snips.
- B. Install panels with manufacturer's recommended gap for panel field and corner joints.

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- C. Fastener holes in the panels shall be predrilled 1/8 inch oversize.
- D. For trowel type and application of adhesive, follow adhesive manufacturer's recommendations.
- E. Utilizing products acceptable to manufacturer, install the system in accordance with panel manufacturer's printed instructions.

3.03 CLEANING

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.04 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 07 42 13

METAL WALL PANELS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Metal lap-seam wall panels with concealed fasteners, including trim and accessories.

B. Related Sections: Section(s) related to this section include:

1. 05_4100 - Structural Metal Stud Framing.
2. 06_1643 - Exterior Gypsum Sheathing.
3. 07_2700 - Plastic Sheet Air Barriers.

1.2 REFERENCES

A. General: Standards listed by reference form a part of this specification section. Standards listed are identified by issuing authority, abbreviation, designation number, title or other designation. Standards subsequently referenced in this Section are referred to by issuing authority abbreviation and standard designation.

B. ASTM International:

1. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E 283 – Standard Test Method for Determining rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across Specimen.
3. ASTM E 330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
4. ASTM E 331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference.
5. ASTM A 653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6. ASTM A 1011 – 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.
7. ASTM E 1592 – Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
8. ASTM D 2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
9. ASTM D 4214 – Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

C. Underwriters Laboratories (UL):

1. UL 263 - Fire Tests of Building Construction and Materials.

D. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):
"Architectural Sheet Metal Manual."

E. State of Florida: 2020 Florida Building Code

1. Apex Series: 34027.1.
2. Contempra Series: 34027.2

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meetings: Conduct preinstallation meeting to clarify Project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

1.4 ACTION SUBMITTALS

A. Product Technical Data: For each type of product required, including manufacturer's preparation recommendations, storage and handling requirements, and recommended installation methods.

B. Shop Drawings: Showing methods of installation, plans, sections, elevations and details wall panels, specified loads, flashings, vents, sealants, interfaces with all materials not supplied by the metal panel system manufacturer, and identification of proposed component parts and their finishes. Do not proceed with fabrication prior to approval of shop drawings.

C. Samples: Selection and verification samples for finishes, colors and textures. Submit two complete sample sets of each type of panel, trim, clip and fastener required.

D. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics, criteria and physical requirements.

E. Test and Evaluation Reports: Showing compliance with specified performance characteristics and physical properties.

F. Qualifications Statements: For manufacturer and installer.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For installed products including maintenance methods and precautions against cleaning materials and methods detrimental to finishes and performance.

B. Warranty: Warranty documents required in this section.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Provider of advanced installer training.
2. Minimum of ten years of experience in manufacturing metal wall panel systems.
3. Provider of products produced in a permanent factory environment with fixed roll-forming equipment.

B. Installer Qualifications:

1. At least five years of experience in the installation of metal wall panels.
2. Experience on at least five projects of similar size, type and complexity as this Project that have been in service for a minimum of two years with satisfactory performance of the wall panel system.
3. Employer of workers for this Project who are competent in techniques required by manufacturer for installation indicated and who shall be supervised at all times when material is being installed.

C. Preinstallation Conference: Conduct a preinstallation conference including framer, wall sheathing installer, air barrier installer and metal siding installer.

E. Fire Resistance Ratings: Determined by testing identical products and assemblies according to UL 263 and ASTM E 84 by a testing agency acceptable to authorities having jurisdiction.

1. Flame-Spread Index: 25 (Class A) or less.

1.8 DELIVERY, STORAGE AND HANDLING

A. General: Comply with manufacturer's current printed product storage recommendations.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage: Store materials above ground, under waterproof covering, protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer. Provide proper ventilation of metal panel system to prevent condensation build-up between each panel and trim or flashing component. Tilt stack to drain in wet conditions. Remove strippable plastic film before storage under high-heat conditions. Store products in manufacturer's unopened packaging until just prior to installation.

D. Handling: Exercise caution in unloading and handling metal panel system to prevent bending, warping, twisting and surface damage.

1.9 WARRANTY

A. Special Concealed Fastened Wall Panel Finish Warranty: Manufacturer's standard form PVDF Fluorocarbon System Warranty for film integrity, chalk rating and fade rating in which manufacturer agrees to repair or replace panels that show evidence of deterioration within specified warranty period.

1. Deterioration shall include but is not limited to:
 - a. Color fading of more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling or failure of paint to adhere to bare metal.
2. Warranty Period: Film integrity for 45 years and chalk and fade rating for 35 years from date of Substantial Completion.
3. Manufacturer's warranty may exclude surface deterioration due to physical damage and exposure to salt air environments.

PART 2 PRODUCTS

2.1 METAL WALL PANELS

A. Basis of Design Product: Subject to compliance with requirements provide Taylor Metal Inc. SmoothWall Soffit Screw Flange 1" X 12", 20 GA. (ICC ESR 5045) panels and trim.

B. Substitution Limitations: All other manufacturers: Submit substitution request with side-by-side, line-by-line comparison of specified product and proposed substitution. Proposed product must have current ICC ESR Report.

C. Product Options:

1. Panel coverage: 12 inches (304.8 mm).
2. Panel thickness: 1-1/2 inches (38.1 mm)].
3. Material: Aluminum-zinc alloy-coated steel sheet, ASTM A 792, ASTM A 653 AZ50 coating designation, structural quality, Grade 33, 0.0356-inch (0.90-mm) minimum thickness.
4. Attachment: Concealed clip fastened panel.
5. Application: Designed for application over open framing or solid substrate.
6. Perforation: None.
7. Surface Finish: PVDF (Kynar 500).
8. Color: As selected by Architect from manufacturer's standard colors.
9. Fire Resistance Rating: Comply with UL 263 Fire Resistance Ratings.
10. Moisture Barrier required for building envelope applications.
11. Code and Testing Agency Approval:
 - a. 2020 Florida Building Code Approved: 34027.1 or 34027.2.

2.2 STRUCTURAL PERFORMANCE

A. Structural Performance Criteria: 20 gauge minimum thickness, 30 PSF wind load rating, minimum.

2.5 ACCESSORIES

A. Products: Trims and closures

1. Basis of Design Product: Subject to compliance with requirements provide Metal Sales Manufacturing Corporation.
2. Color: to match wall panels.

2.6 SOURCE QUALITY CONTROL

A. Source: Obtain metal wall panels, trim and other accessories from a single manufacturer.

B. Quality Control: Obtain metal wall panels, trim and other accessories from a manufacturer capable of providing on-site technical support and installation assistance.

PART 3 EXECUTION

3.1 PREPARATION

A. Miscellaneous Framing: Install furring, angles, sub-purlins, and other miscellaneous wall panel support members and anchorage according to metal wall panel manufacturer's recommendations.

3.2 METAL WALL PANEL INSTALLATION

A. General: Comply with panel manufacturer's installation instructions including but not limited to special techniques, interface with other work, and integration of systems.

B. Fasten metal wall panels to supports with concealed clips at each standing-seam joint at location, spacing, and using proper fasteners as recommended by panel manufacturer.

C. Tolerances: ¼" in eight feet.

D. Drainage: Provide positive drainage to exterior for moisture entering or condensation forming within panel system.

3.3 ACCESSORY INSTALLATION

A. General: Install accessories using techniques recommended by manufacturer and which will assure positive anchorage to building and weather tight mounting. Provide for thermal movement. Coordinate installation with flashings and other components.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and the SMACNA "Architectural Sheet Metal Manual." Provide concealed fasteners where possible and install units to true level. Install work with laps, joints, and seams that will be permanently watertight.

3.4 CLEANING

A. Remove temporary coverings and protection of adjacent work areas.

B. Repair or replace any installed products that have been damaged.

C. Clean installed panels in accordance with manufacturer's instructions prior to Owner's acceptance.

D. Remove and lawfully dispose of construction debris from Project site.

3.5 PROTECTION

A. Protect installed product and finish surfaces from damage during construction.

END OF SECTION 07 42 13 – METAL WALL PANELS

SECTION 07 2100
THERMAL INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Thermal batt insulation for exterior walls and under roof decks.
2. Thermal batt insulation in furring at concrete or masonry walls.
3. Extruded polystyrene board at horizontal and vertical waterproofing.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 05 3000 - Metal Decking.
3. Section 05 4100 - Structural Metal Stud Framing.
4. Section 07 1326 - Self-Adhering Sheet Waterproofing.
5. Section 07 2719 –Plastic Sheet Air Barriers.
6. Section 09 2216 - Non-Structural Metal Framing.
7. Section 09 2423 – Cement Plaster and Metal Lath.
8. Section 09 8100 – Acoustical Insulation.

1.02 SUBMITTALS

A. Product Data:

1. Material List: Provide a list of materials for installation under this section.
2. Provide manufacturer's printed Product Data for each type insulation and accessory.

B. Manufacturer's Instructions: Submit manufacturer's printed installation instructions.

- C. Certification: Provide certification that insulation materials conform to requirements of CBC Chapter 7, Section 720 and Chapter 26.
- D. Recycled Content: Provide certification that insulation materials contain a minimum 30 percent recycled materials.

1.03 QUALITY ASSURANCE

- A. Surface Burning Characteristics: Flame spread rating shall not exceed 25 and smoke density shall not exceed 50 when tested in accordance with ASTM E84.
- B. Combustion Characteristics: Rated as non-combustible when tested in accordance with ASTM E136.
- C. Comply with following as a minimum requirement:
 1. ASTM C209 – Standard Test Methods for Cellulosic Fiber Insulating Board.
 2. ASTM C553: Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 3. ASTM C578: Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 4. ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.
 5. ASTM D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
 6. ASTM D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics.
 7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 8. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.
- D. CHP Low-Emitting Materials Table: Materials submitted for building insulation must be listed as low emitting on the CHPS website, www.CHPS.net, or must be tested by an independent laboratory to meet CHPS requirements. Components of an assembly must meet CHPS requirements individually or in an assembly.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to Project site and store in a safe, dry place, with labels intact and legible at time of installation.

- B. Protect building insulation materials from damage.

1.05 PROJECT CONDITIONS

- A. Avoid exposure to humidity and moisture. Protect from exposure to sunlight.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Owens Corning.
- B. Johns Manville.
- C. CertainTeed Corporation.
- D. The DOW Chemical Company.
- E. DiversiFoam Products.
- F. Equal.

2.02 MATERIALS

- A. General:
 - 1. Provide Unfaced, friction-fit batt insulation where both sides of installation are enclosed.
 - 2. Provide batt insulation with integral vapor barrier when one side of installation will be unenclosed.
 - 3. Provide batt insulation with integral vapor barrier where at least one side of installation will be exposed to high humidity, such as showers.
 - 4. Recycled content shall be a minimum of 30 percent.
- B. Mineral Fiber Batt Insulation:
 - 1. Unfaced Mineral Fiber Batt Insulation: Provide friction-fit, unfaced mineral fiber batts. Insulation shall consist of mineral fibers, glass or slag, and thermosetting resins complying with ASTM C665, Type I.
 - 2. Faced Mineral Fiber Batt Insulation: Provide mineral fiber batts with vapor barrier consisting of mineral fibers, glass or slag, and thermosetting resins

complying with ASTM C665, Type III, Class A, with vapor-retardant membrane facing.

3. Fasteners for Attaching Insulation to Wood Framing:
 - a. For faced batt insulation provide one of following types of staples: Stainless steel, monel, or copper-coated steel, size as required by manufacturer or applicable code.
 - b. For unfaced batt insulation provide 18 gage, minimum, galvanized steel wire where required to maintain proper insulation placement.
4. Fasteners for Attaching Insulation to Underside of Metal Roof Decks:
 - a. Spindle Anchors: Stic-Klip Mfg. Co., Type A or B as required, with Type S adhesive; Miracle Adhesives Corp. "Miracle StukUps" with Type HT994 adhesive; or Goodloe E. Moore Gemco or Tuff-Weld with G-P Improved or Tuff-Bond Quik-Set Type Adhesive as applicable; or equal. Provide adhesives of correct type for substrates and type of anchor.
 - b. String Wires: Minimum 18 gage galvanized steel wire.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine Work to verify suitability to receive insulation. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General:
 1. Fit batt insulation, of R-value indicated on Drawings, snugly between framing members.
 2. Maintain total insulation integrity over entire area to be insulated, including areas between closely spaced members.
 3. Extend full thickness insulation over entire area to be insulated. Furnish manufacturer's recommended clips to tightly fit batts at joints.
 4. Cut and fit batt insulation tightly around pipes, conduits and penetrations.
 5. Do not compress batt insulation in excess of 10 percent (R-19 may be installed in 2 by 6 stud walls).

6. Prevent batt insulation from sagging during and after installation by installing adequate wire.
7. Metal door and window frames in acoustically insulated walls shall be filled with insulation, unless otherwise indicated.
8. Where vapor barrier is provided, install with vapor barrier facing room.
 - a. Batts in Metal Framing: Provide friction-fit batts tightly fitted to stud webs and to metal furring.
 - b. Batts under Metal Roof Decks where underside of insulation will be exposed install foil-faced flanged-type insulation batts and staple flanges together at maximum 4-inch centers and seal joints at abutting vertical surfaces with a pressure-sensitive plastic tape. Where underside of insulation will be inaccessible, install secure with spindle anchors. Provide 18 gage galvanized string wires under batts wherever necessary to prevent sagging. Stretch wire taut.
 - c. Batts in Horizontal or Sloped Applications: Provide tightly stretched string wires along center of horizontal or sloping batts where support spacing exceed 16 inch on centers.
 - d. Batts in Ceiling Framing: Install batts between joists, so top of insulation is level with top of framing members. Do not install insulation over recessed lighting fixtures, speakers, or other heat producing elements in ceilings. At junction boxes, access panels, and other items requiring access from above or below ceiling, cut insulation on each side to fit item and install loosely on top. Fit insulation snugly around ducts, conduits, pipes, and other items projecting through ceiling construction.
9. Install polystyrene board as required by Section 07 1326.

3.03 PROTECTION

- A. Protect Work of this section until Substantial Completion.

3.04 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

SECTION 07 2600
VAPOR BARRIERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. installation of under-slab vapor barriers.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 3000: Cast-in-Place Concrete.
3. Division 09: Finishes; flooring sections.

1.02 REFERENCES

A. American Concrete Institute (ACI) Publication:

1. ACI 302.2R - Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

B. ASTM International (ASTM):

1. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
2. ASTM D1709 - Standard Test Methods of Impact Resistance of Plastic Film by the Free-Falling Dart Method.
3. ASTM E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs.
4. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
5. ASTM E1643 - Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for vapor barrier and accessories.
- B. Samples:
 - 1. 12 inch by 12 inch vapor barrier samples.
 - 2. Pressure-Sensitive Tape: 12 inch long sample.
- C. Test Reports: Conducted by nationally recognized independent testing agency indicating conformance with specified performance requirements.

1.04 QUALITY ASSURANCE

- A. ASTM tests referenced in this Section shall be performed on a single production roll per ASTM E1745 Section 8.1. Submit third party documentation certifying this requirement.
- B. Pre-Installation Conference: CONTRACTOR shall coordinate and conduct pre-installation conference in accordance to Section 01 3119, Project Meetings, to review the progress of construction activities and preparations for the installation of vapor barrier.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, handle and protect in accordance with manufacturer's instructions and recommendations.
- B. Deliver materials in manufacturer's packaging with labels intact.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Multi-layer plastic extrusion manufactured with high grade prime, virgin, polyolefin resins. Thickness shall be 15 mils minimum.
 - 1. Stego Wrap by Stego Industries LLC.
 - 2. Perminator by W.R. Meadows.
 - 3. Ecoshield-E by Epro.
 - 4. Equal.
- B. Physical Properties:
 - 1. Maintain permeance of less than 0.01 Perms [grains/(ft² · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).

2. Class Rating per ASTM E1745: Class A.
 3. Puncture resistance per ASTM D 1709: 2200 g or higher.
 4. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1
- C. Accessories: Provide manufacturer recommended accessories for seams, penetrations and perimeter edges, including tapes, mastics, termination for a complete vapor barrier installation per ASTM E1643.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsoil and notify OWNER of deficiencies detrimental to proper vapor barrier installation; do not proceed until corrected.

3.02 INSTALLATION

- A. Install vapor barrier in accordance ASTM E1643 and manufacturer's instructions.
1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
 2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise, where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself using manufacturer ASTM E1643 compliant accessory designed to adhere to concrete. Seam tape shall not be used for sealing the vapor barrier to the foundation wall, grade beam or slab.
 3. Overlap joints 6 inches and seal with manufacturer's seam tape.
 4. Seal vapor barrier penetrations per manufacturer's instructions.
 5. Avoid the use of non-permanent stakes driven through the vapor barrier.
- B. Prior to concrete placement inspect vapor barrier for damage. Clean damaged areas and with vapor barrier material cut a minimum 6 inches larger than damaged area on all sides. Seal to main vapor barrier with continuous seam tape.

3.03 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.04 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 07 2719
PLASTIC SHEET AIR BARRIERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Mechanically attached permeable flexible plastic sheet air barriers.
2. Flexible flashing of openings, penetrations, joints, and terminations of exterior walls and taping of seams.

B. Related Requirements:

1. Section 05 4100 – Structural Metal Stud Framing.
2. Section 07 6000 – Flashing and Sheet Metal.
3. Section 07 9200 – Joint Sealants.
4. Section 08 4113 - Aluminum Entrances and Storefronts.
5. Section 08 511 3- Aluminum Windows.
6. Section 09 2423 – Cement Plaster and Metal Lath.

1.02 REFERENCES

A. ASTM International:

1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E1677 - Standard Specification for an Air Barrier (AB) Material or System for Low-Rise Framed Building Walls.
3. ASTM E2178 – Standard Test Method for Air Permeance of Building Materials.

B. International Code Council (ICC):

1. ICC-ES Evaluation Reports.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each material and component proposed for installation.
- B. Shop Drawings: Dimensioned plans and elevations indicating:
 - 1. Complete information as to size and location of openings, sleeves, conduits, ducts, boxes, inserts, attachments, and structural interferences.
 - 2. Layout of air barrier showing sheet lapping, cutting, flashing and taping, with references to enlarged details.
- C. Installation Instructions: Submit detailed manufacturer's installation instructions.
- D. Material Samples: Submit minimum 8-1/2-inch by 11-inch samples of air barrier, and 12 inch long flashing.
- E. Test Reports: Submit Test Reports showing performance characteristics equaling or exceeding those specified.
- F. Evaluation Reports: Submit ICC-ES Evaluation Report demonstrating conformance of plastic sheet air barrier to CBC 1404.2, for use as water-resistive barrier.
- G. Qualification Statements:
 - 1. Installer: Statement from plastic sheet air barrier manufacturer indicating installer is approved, certified, or has been trained for the installation of their products.

1.04 QUALITY ASSURANCE

- A. Manufacturer:
 - 1. Plastic sheet air barrier components and accessories shall be from a single source.
 - 2. Manufacturer shall have a minimum of five years of continued experience in the manufacture of the specified products.
- B. Installer:
 - 1. Minimum five years in the installation of air/weather barriers.
 - 2. Trained or certified by manufacturer for the installation of their products.
- C. Mock-up: Refer to Section 09 2423, Cement Plaster and Metal Lath.
- D. Pre-Installation Conference: CONTRACTOR shall coordinate and conduct pre-installation conference in accordance to Section 01 3119, Project Meetings, to review the progress of construction activities related to the installation of plastic sheet air barrier. In addition to the conference attendees listed on Section 01 3119, plastic sheet air barrier installer and manufacturer technical representative shall attend pre-installation conference.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the job site in undamaged and original packaging.
- B. Store materials in a clean, dry, protected location and within temperature range required by plastic sheet air barrier manufacturer. Protect stored materials from direct sunlight.
- C. Handle materials in accordance with Manufacturer's recommendations.

1.06 WARRANTY

- A. Provide a ten year manufacturer's standard material warranty for replacement of plastic sheet air barriers that fail due to material defects.
- B. Installation Warranty: Provide a two year installation warranty for the plastic sheet air barrier, including accessories, against loss of water-tight seal and loss of attachment.
- C. Warranty shall start on the day of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Manufacturer and Products:
 - 1. DuPont (E. I. du Pont de Nemours and Company): Tyvek CommercialWrap.
 - 2. Polymer Group Inc., TyparMetroWrap.
 - 3. Equal.
- B. Properties:
 - 1. Plastic sheet air barrier shall be Type I in accordance to ASTM E1677.
 - 2. Air Permeance: shall not exceed 0.004 cfm/ft², under a pressure differential of 0.3 in w.g. (1.57 psf) (0.02 L/m² at 75 Pa), when tested in accordance with ASTM E2178.
 - 3. Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested in accordance to ASTM E84.

2.02 MISCELLANEOUS MATERIALS

- A. Flashing: Self-adhesive butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).
 - 1. DuPont (E. I. du Pont de Nemours and Company); FlexWrap and StraightFlash.

2. Polymer Group Inc.; Flashing Flex and Flashing AT.
 3. Equal.
- B. Fasteners: Manufacturer approved fasteners.
- C. Tape: Three inch wide seam tape. Pressure-sensitive plastic tape recommended by air barrier manufacturer for sealing joints and penetrations in air barrier.
- D. Sealants and Adhesive Primers: Compatible with plastic sheet air barrier and flashings system.
1. Sealant: Dow Corning 732.
 2. Spray Adhesive: Design Polymerics DP77.
 3. Equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas and conditions under which plastic sheet air barrier will be installed.
- B. Verify that substrate to receive air barrier has been completed and inspected before commencement of work.
- C. For the installation of flashing and tape, surface shall be smooth, clean, dry and free from voids, loose substrate, protrusions, or any material that would hinder adhesion.

3.02 INSTALLATION

- A. Install plastic sheet air barrier in accordance to manufacturer's installation guidelines, providing continuity throughout exterior walls. Install plastic sheet air barrier with drainage plane surface pattern in vertical position for proper drainage.
- B. Install plastic sheet air barrier starting from the bottom of the building up to ensure proper overlapping of vertical and horizontal seams. Upper layer of plastic sheet air barrier shall overlap bottom layer by a minimum of six inches. Plastic sheet air barrier shall extend over the weep screed by two inches and be taped down.
- C. Secure plastic sheet air barrier by fastening into studs at 12 to 18 inches on center vertically.
- D. Unroll plastic sheet air barrier directly over windows and doors rough openings. Do not install fasteners within six inches of the sills and jambs of the openings and within nine inches of the header, plastic sheet air barrier shall be fastened at these locations during flashing installation.

- E. Horizontal joints shall be overlapped a minimum of six inches with upper courses overlapping lower courses in water-shedding fashion. Vertical seams shall be overlapped a minimum of six inches. Overlap corners of building a minimum of 12 inches.
- F. Tape vertical and horizontal seams using adhesive tape recommended by manufacturer. Seal tears and cuts with adhesive tape as recommended by manufacturer.
- G. Place patch or strip of self-adhered flashing over plastic sheet air barrier where base plates, metal channels, z-girts, or other hardware will be installed.

3.03 FLASHING

- A. Cut air barrier from door and window openings along jambs and sill. Cut a header flap at 45 degree angle to expose eight inches of plastic sheet air barrier to allow for head flashing installation. Install sill flashing per manufacturer instructions, overlapping up the jambs a minimum of six inches on each side.
- B. Wrap flashing around interior jamb, wall face and exterior jamb, overlapping the vertical portion of the sill flashing by at least two inches.
- C. Adhere flashing to the head following manufacturer's instructions. Flashing shall wrap jamb flashings by a minimum of two inches.
- D. Flash piping, conduit, duct and similar penetrations through walls, and flashing ledgers and sills as recommended by manufacturer.

3.04 FIELD QUALITY CONTROL

- A. Manufacturer's technical representative shall inspect the work and submit a statement indicating that the installation has been done in conformance to manufacturer's installation instructions.

3.05 CLEANING

- A. Remove rubbish, debris, and waste material and legally dispose of off the Project site.

3.06 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 07 6000
FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Sheet metal flashings in connection with roofing.
2. Reglet and counter flashing assemblies.
3. Miscellaneous metal flashing and counter flashing as required, except where provided under Divisions 22, Plumbing, 23, HVAC, or 26, Electrical.
4. Drip flashings.
5. Roof pipe flashings.
6. Roof expansion joint covers.
7. Other sheet metal items, not necessarily specified herein or in other sections, but required to prevent penetration of water into building.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 05 3000 – Metal Decking.
3. Section 07 9200 - Joint Sealants.
5. Section 09 2423 - Cement Plaster and Metal Lath
6. Division 22 -- Plumbing.
7. Division 23 - HVAC.
8. Division 26 - Electrical.

1.02 SUBMITTALS

- A. Shop Drawings: Submit for fabricated sheet metal indicating shapes, details, methods of joining, anchoring and fastening, thicknesses and gages of metals, concealed reinforcement, expansion joint details, sections, and profiles.
- B. Samples: Submit Samples for materials or assemblies as requested.
- C. Product Data: Submit brochures of manufactured items.

1.03 QUALITY ASSURANCE

- A. Drawings and requirements specified govern. Provide the Work of this section in conformance with the Architectural Sheet Metal Manual published by SMACNA for conditions not indicated or specified and for general fabrication of sheet metal items.
- B. Materials shall conform to following standards:
 - 1. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
 - 2. ASTM A653 - Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 3. ASTM B370 - Copper Sheet and Strip for Building Construction.
- C. Pre-installation Meetings: Refer to Division 07 roofing sections as appropriate. Attend the pre-installation and inspection meetings for roofing Work.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Do not install bent or otherwise damaged materials.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Galvanized Sheet Steel: ASTM A653, coating designation G90, hot-dip galvanized.
- B. Copper Plate, Sheet and Strip: ASTM B370, cold-rolled, tempered. Copper sheet and strip shall be cold-rolled-temper.
- C. Stainless Steel: Plate, sheet and strip shall conform to ASTM A167, Type 304 or Type 316, No. 4 finish on exposed surfaces and No. 2 finish on concealed surfaces unless otherwise specified or indicated. Furnish Type 304 for general applications and Type 316 where exposed to acidic or alkaline conditions.
- D. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
 - 1. As-Milled Finish: **Mill**.
- E. Fastenings:
 - 1. Galvanized Steel: Nails, rivets, and other fastenings furnished in connection with galvanized sheet steel Work shall be sealed with rust resistive coating. Rivets shall be tinned. Nails and other fastenings shall be zinc-coated.
 - 2. Copper: Nails, rivets, and other fastenings furnished in connection with copper sheet metal Work, shall be manufactured from hard-temper copper or hard brass.
 - 3. Stainless Steel: Nails, rivets and other fastenings furnished in connection with stainless steel Work, shall be 300 series alloy to match alloy of stainless steel being fastened.

- F. Soldering Flux: Raw muriatic acid for galvanized steel; rosin for tin, lead and tinned copper; non-corrosive soldering salts for uncoated copper and acid-type flux formulated for soldering stainless steel.
- G. Solder: ASTM B32, Grade 5A, composed of 95-5 tin-antimony. Name of product manufacturer and grade designation shall be labeled, stamped or cast onto each coil or bar.

2.02 FABRICATION

- A. General:
 1. Accurately form sheet metal Work to dimensions and shapes indicated and required. Cope finish molded and brake metal shapes with true, straight, sharp lines and angles and, where intersecting each other, to a precise fit. Unless otherwise specified, all galvanized sheet steel shall be 22 gage. Exposed edges of sheet metal shall have a ½ inch minimum hemmed edge.
 2. Soldering of sheet steel or copper shall be performed with well-heated copper soldering iron or soldering torch, joints full flowing, neat and consistent. Fill joint completely with solder. Clean materials at joints before soldering, and tin coppers before soldering. Exposed soldering on finished surfaces shall be scraped smooth. Lock seam work shall be fabricated flat and true to line and soldered along its entire length. Acid-fluxed Work shall be neutralized after fabrication.
 3. Form and install sheet metal Work to provide proper allowances for expansion and contraction, without causing undue stresses in any part of completed Work. Installation shall be water and weathertight.
- B. Reglet Type Counterflashing: Where roof comes in contact with vertical surfaces, provide counterflashing. Set top of counter flashing 8 inches above roof deck unless otherwise indicated, and extend down at least 5 inches or to top of cant strip. Counterflashing and reglet shall be 22 gage galvanized sheet steel. Lap counter flashing and reglet 3 inches minimum at splices and miter at angles, or supply special metal corner fittings. Reglet and method of securing flashing shall be so constructed that flashing is firmly locked in place, but may be readily removed for replacement.
- C. Roof Expansion Joint Covers: Fabricate of 22 gage galvanized sheet steel, as detailed. One side of joint shall be zee shaped, with 3-inch standing leg extended over the joint and turned down. The other side shall be box shaped, fabricated to extend over the joint, over the standing leg, and turn down to form a water barrier. Prefabricated bellows type joint covers are not permitted.
- D. Miscellaneous Flashing: Unless otherwise indicated, miscellaneous flashing shall be fabricated of galvanized steel. Exterior doors and windows, unless covered by overhangs shall be provided with 22 gage galvanized steel drip flashing as detailed. At wood construction, nail flashing to framing before paper backed lath is installed.
- E. Roof Pipe Flashings: Provide PVC flashings or prefabricated welded or seamless flashings.

PART 3 - EXECUTION

3.01 PREPARATION

MOORPARK COLLEGE

ALTERATION TO STUDENT SERVICES ANNEX (A#33484) NEXT-UP
VENTURA COUNTY COMMUNITY COLLEGE DISTRICT

FLASHING AND SHEET METAL
07 6000-3

- A. Concrete and masonry materials in contact with sheet metal shall be painted with alkali resistant coating, such as heavy-bodied bituminous paint. Wood in contact with sheet metal shall be painted with two coats of aluminum paint or one coat of heavy-bodied bituminous paint.

3.02 INSTALLATION

- A. General: Coordinate with installation of underlayment indicated in the Drawings and specified in Section 09 2423.
- B. Reglets: Install reglets at constant height above cant or as indicated. Provide minimum 3-inch lap at end splices of reglets. Seal laps watertight.
- C. Counterflashing:
 - 1. Install at constant horizontal elevation across roof slope and slope at constant height above cant or as indicated.
 - 2. Provide minimum 3-inch lap at all end splices of counterflashing.

3.03 TESTING

- A. Perform field water testing to demonstrate installation is watertight. Continue testing with a continuous hose stream applied at base of installation for at least 30 minutes. If leaking is observed, discontinue test and repair installation, then test until satisfactory results are obtained.

3.04 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.05 CLEANING

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 07 9200

JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Joint sealants.
 - 2. Preparation for application of sealants.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 3. Section 07 8413 - Penetration Firestopping.
 - 4. Division 08 - Openings.
 - 5. Division 09 - Finishes.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating sealant joint locations, with full-size sealant joint details.
- B. Product Data: Submit manufacturer's literature for each sealant material.
- C. Material Samples: Submit Samples indicating color range available for each sealant material intended for installation in exposed locations.
- D. Certifications: Submit manufacturer's certification materials comply with requirements specified.
- E. Site Samples: At locations required, provide a Sample of sealant for each typical installation, approximately 24 inches long, including joint preparation, backing, sealant and tooling. Allow backing to extend 6 inches beyond end of sealant for inspection of substrate.
- F. Test Reports: Submit manufacturer's adhesion compatibility test reports according to ASTM C794 for each substrate.

1.03 QUALITY ASSURANCE

- A. Qualifications of Installer: The Work of this section shall be installed by a firm which has been in the business of installing similar materials for at least five consecutive years; and can show evidence of satisfactory completion of five projects of similar size and scope.

Installer shall have applicators trained and approved by manufacturer for performing this Work.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Store in accordance with manufacturer's recommendations. Provide a uniform ambient temperature between 60 and 80 degrees F.

1.05 WARRANTY

- A. Manufacturer: five year material warranty.
- B. Installer: two year installation/application warranty.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Furnish sealants meeting following in-service requirements:
 1. Normal curing schedules are permitted.
 2. Non-staining, color fastness (resistance to color change), and durability when subjected to intense actinic (ultraviolet) radiation are required.
- B. Furnish the products of only one manufacturer unless otherwise required, sealant colors as selected to match the adjoining surfaces.

2.02 MATERIALS

- A. Sealants:
 1. Sealant 1: Acrylic latex, one-part, non-sag, mildew resistant acrylic emulsion compound complying with ASTM C834, Type S, Grade NS, formulated to be paintable.
 - a. Tremco Inc., Acrylic Latex Caulk.
 - b. Pecora Corporation, AC-20.
 - c. Equal.
 2. Sealant 2: Butyl sealant, one-part, non-sag, solvent-release-curing sealant complying with ASTM C1311, gun grade and formulated with a minimum of 75 percent solids.
 - a. Tremco Inc., Tremco Butyl Sealant.
 - b. Pecora Corp., BC-158.
 - c. Equal.

3. Sealant 3: Silicone sealant, one-part non-acid-curing silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25.
 - a. Dow Corning Corp., Dow Corning 790, 791, 795.
 - b. General Electric Co., Silpruf.
 - c. Tremco, Inc., Spectrem 1.
 - d. Pecora Corp., 864.
 - e. Equal.
 4. Sealant 4: One-part mildew-resistant silicone sealant, complying with ASTM C920, Type S, Grade NS, Class 25.
 - a. Dow Corning Corp., Dow Corning 786.
 - b. General Electric Co., Sanitary 1700.
 - c. Tremco, Inc., Proglaze White.
 - d. Equal.
 5. Sealant 5: One-part non-sag urethane sealant, complying with ASTM C920, Type S, Grade NS, Class 25.
 - a. Sika Corporation, Sikaflex -221e.
 - b. Equal.
 6. Sealant 6: Multi-part pouring urethane sealant, complying with ASTM C920, Type M, Grade P, Class 25.
 - a. Sika Corporation, Sikaflex 2C NS/SL.
 - b. Equal.
 7. Sealant 7: Acoustical sealant, non-drying, non-hardening permanently flexible conforming to ASTM D217.
 - a. Pecora Corp., BA-98 Acoustical Sealant.
 - b. Equal.
- B. See 07 8413 - Penetration Firestopping for rated sealants.
- C. Joint Backing: ASTM D1056; round, closed cell Polyethylene Foam Rod; oversized 30 to 50 percent larger than joint width, reticulated polyolefin foam.
- D. Primer: Non-Staining Type. Provide primer as required and shall be product of manufacturer of installed sealant.

- E. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer.
- F. Sealants shall have normal curing schedules, shall be nonstaining, color fast and shall resist deterioration due to ultraviolet radiation.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that joint openings are ready to receive Work and field tolerances are within the guidelines recommended by sealant manufacturer.

3.02 SURFACE PREPARATION

- A. Joints and spaces to be sealed shall be completely cleaned of all dirt, dust, mortar, oil, and other foreign materials which might adversely affect sealing Work. Where necessary, degrease with a solvent or commercial degreasing agent. Surfaces shall be thoroughly dry before application of sealants.
- B. If recommended by manufacturer, remove paint and other protective coatings from surfaces to be sealed before priming and installation of sealants.
- C. Preparation of surfaces to receive sealant shall conform to the sealant manufacturer's specifications. Provide air pressure or other methods to achieve required results. Provide masking tape to keep sealants off surfaces that will be exposed in finished Work.
- D. Etch concrete or masonry surfaces to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance. Etch with 5 percent solution of muriatic acid; neutralize with dilute ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.
- E. Perform preparation in accordance with ASTM C804 for solvent release sealants, and ASTM C962 for elastomeric sealants.
- F. Protect elements surrounding Work of this section from damage or disfiguration.

3.03 SEALANT APPLICATION SCHEDULE

	Location	Type	Color
A.	Exterior and Interior joints in horizontal surfaces of concrete; between metal and concrete masonry and mortar.	Sealant 6	To match adjacent material
B.	Exterior door, entrance and window frames. Exterior and interior vertical joints in concrete and masonry metal flashing.	Sealant 3 or 5	To match adjacent material

C.	Joints within glazed curtain wall system. Skylight framing system. Aluminum entrance system glass and glazing.	Sealant 3	Translucent or Black
D.	Interior joints in ceramic tile and at plumbing fixtures.	Sealant 4	Translucent or White
E.	Under thresholds.	Sealant 2	Black
F.	All interior joints not otherwise scheduled	Sealant 1	To Match Adjacent Surfaces
G.	Heads and sills, perimeters of frames and other openings in insulated partitions	Sealant 7	Match Adjacent Surfaces

3.04 APPLICATION

- A. Provide sealant around all openings in exterior walls, and any other locations indicated or required for structure weatherproofing and/or waterproofing.
- B. Sealants shall be installed by experienced mechanics using specified materials and proper tools. Preparatory Work (cleaning, etc.) and installation of sealant shall be as specified and in accordance with manufacturer's printed instructions and recommendations.
- C. Concrete, masonry, and other porous surfaces, and any other surfaces if recommended by manufacturer, shall be primed before installing sealants. Primer shall be installed with a brush that will reach all parts of joints to be filled with sealant.
- D. Sealants shall be stored and installed at temperatures as recommended by manufacturer. Sealants shall not be installed when they become too jelled to be discharged in a continuous flow from gun. Modification of sealants by addition of liquids, solvents, or powders is not permitted.
- E. Sealants shall be installed with guns furnished with proper size nozzles. Sufficient pressure shall be furnished to fill all voids and joints solid. In sealing around openings, include entire perimeter of each opening, unless indicated or specified otherwise. Where gun installation is impracticable, suitable hand tools shall be provided.
- F. Sealed joints shall be neatly pointed on flush surfaces with beading tool, and internal corners with a special tool. Excess material shall be cleanly removed. Sealant, where exposed, shall be free of wrinkles and uniformly smooth. Sealing shall be complete before final coats of paint are installed.

- G. Comply with sealant manufacturer's printed instructions except where more stringent requirements are indicated on Drawings or specified.
- H. Partially fill joints with joint backing material, furnishing only compatible materials, until joint depth does not exceed 1/2 inch joint width. Minimum joint width for metal to metal joints shall be 1/4 inch. Joint depth, shall be not less than 1/4 inch and not greater than 1/2 inch.
- I. Install sealant under sufficient pressure to completely fill voids. Finish exposed joints smooth, flush with surfaces or recessed as indicated. Install non-tracking sealant to concrete expansion joints subject to foot or vehicular traffic.
- J. Where joint depth prevents installation of standard bond breaker backing rod, furnish non-adhering tape covering to prevent bonding of sealant to back of joint. Under no circumstances shall sealant depth exceed 1/2 inch maximum, unless specifically indicated on Drawings.
- K. Prime porous surfaces after cleaning. Pack joints deeper than 3/4 inch with joint backing to within 3/4 inch of surface. Completely fill joints and spaces with gun applied compound, forming a neat, smooth bead.

3.05 MISCELLANEOUS WORK

- A. Sealing shall be provided wherever required to prevent light leakage as well as moisture leakage. Refer to Drawings for condition and related parts of Work.
- B. Install sealants to depths as indicated or, if not indicated, as recommended by sealant manufacturer but within following general limitations:
 - 1. For joints in concrete walks, slab and paving subject to traffic, fill joints to a depth equal to 75 percent of joint width, but not more than 3/4 inch deep or less than 3/8 inch deep, depending on joint width.
 - 2. For building joints, fill joints to a depth equal to 50 percent of joint width, but not more than 1/2 inch deep or less than 1/4 inch deep.

3.06 CLEANING

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.07 CURING

- A. Sealants shall cure in accordance with manufacturer's printed recommendations. Do not disturb seal until completely cured.

3.08 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 08 1113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Hollow metal doors and frames or hollow metal doors as indicated.
2. Hollow metal window frames or hollow metal door and window frames.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 07 9200 - Joint Sealants.
3. Section 08 1416 - Flush Wood Doors.
4. Section 08 7100 - Door Hardware.
5. Section 08 8000 - Glazing.
6. Section 09 9000 - Painting and Coating.
7. Section 28 1600 - Intrusion Detection Systems.

1.02 DESIGN REQUIREMENTS

- A. Door-and-frame assemblies or frames shall include reinforcing and provisions for hardware as shown and specified. Drawings indicate profile and general details of steel frame fabrication and installation.

1.03 SUBMITTALS

- A. Shop Drawings: Submit composite Shop Drawings indicating detailed relationships of installation including Work of adjacent construction, finish hardware, security, fire and life safety devices, glazing, sealing, and requirements for field installation. Include elevations of each hollow metal door type, details of each frame type, location schedule of doors and frames indicating same reference for details and openings as indicated on Drawings, conditions of openings of various wall sections and materials, typical and special details of construction, methods of assembling sections, location and installation requirements for hardware, material size, shape, and thickness, and joints and connections.

- B. Product Data: Submit manufacturer's Product Data indicating composition and construction for each fabricated item including louvers, coatings, finishes, and other components demonstrating compliance with referenced standards.
- C. Certification: Submit certification of compliance with referenced standards and specified criteria, including but not limited to fire ratings in accordance with UL 10C, Physical Endurance in accordance with ANSI A250.4 and Prime Paint performance in accordance with ANSI A250.10..
- D. Samples:
 - 1. Hollow Metal Frame: Corner section of typical exterior and interior frame, of sufficient composite size to illustrate corner joint construction, hinge reinforcement, closer re-enforcement, floor anchor, dust cover, and jamb anchors, and showing galvanizing and prime coat finishes.
 - 2. Hollow Metal Door: Section of typical interior door of sufficient composite size to illustrate edge, top, bottom, and core construction, hinge reinforcement and face stiffening, closer reinforcement and kick plate reinforcement, and corner of vision opening construction with glazing beads.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum documented experience of more than five years in work of this section.
- B. Installer Qualifications: Minimum documented experience of more than five years in work of this section
- C. Coordinate with hardware supplier for fabrication of doors and frames to receive hardware items.
- D. Coordinate with intrusion alarm supplier for fabrication of doors and frames to receive intrusion detection devices.
- E. References: Work shall comply with physical and performance requirements of following standards, including standards referenced in them, except for more stringent provisions specified herein or required by regulatory agencies:
 - 1. ANSI/SDI A250.8, SDI 100 Recommended Specifications for Standard Steel Doors and Fames.
 - 2. ANSI/NFPA 252, Fire Tests of Door Assemblies.
 - 3. ANSI/UL 10B, Fire Tests of Door Assemblies.
 - 4. ANSI/UL 10C, Positive-Pressure Fire Tests of Door Assemblies.

5. ANSI/NFPA 80, Fire Doors and Fire Windows
6. HMMA, Guide Specifications for Commercial Hollow Metal Doors & Frames (Standard of National Association of Architectural Metal Manufacturers).
7. ANSI/SDI A250.4, Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings.
8. ANSI A250.10, Test Procedure and Acceptance Criteria for Prime Painted Steel Doors and Frames.
9. ANSI A250.6, Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.

F. Standards of Fabrication and Installation:

1. Finished Work shall be of uniform profile, accurately fabricated, rigid and strong, square and true, neat in appearance, smooth and free from dents, waves, warps, buckles, open joints, tool marks and/or other defects.
2. Steel sheet shall be clean with smooth surfaces free of scale, pitting or other defects.
3. Construction joints shall be flush, tight and welded their full length, ground flush and smooth on exposed surfaces.
4. Frame and door reinforcing and hardware provisions shall be performed in fabrication shop. Provide cuts, welds, and other fabrications before galvanizing or shop priming.
5. Lines and molded members shall be straight and true with angles as sharp as practical for thickness involved, surfaces flat, and fastenings concealed.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Frames: Before shipment, install temporary spreaders at bottom of bucks and do not remove until frames are installed.
- B. Doors: Provide protection as required to protect doors during shipping and storage. Damaged doors will be rejected.
- C. Inspect hollow metal Work upon delivery for damage. Remove and replace damaged items with new Work as required.
- D. Store doors and frames in an upright position at Project Site under cover and protected from weather-related elements. Store units on minimum 4-inch high wood blocking with ½ inch air spaces between stacked doors to provide circulation. Do not store

doors and frames under plastic or canvas shelters that can create a humidity chamber. If shipping packaging becomes wet, immediately remove packaging.

1.06 WARRANTY

- A. Manufacturer shall provide a five year material warranty.
- B. Installer shall provide a two year fabrication and installation warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Doors and frames shall be products of a single manufacturer.
- B. The following are acceptable manufacturers, as are others that can demonstrate their products are equivalent in quality, performance and compliance with these specifications.
 - 1. Security Metal Products Corp.
 - 2. Curries Manufacturing, Inc.
 - 3. Steelcraft.
 - 4. Amweld Metal Doors and Frames.
 - 5. Stiles Custom Metal, Inc.
 - 6. Door Components Inc.
 - 7. CECO Door.
 - 8. Equal.
- C. Materials, fabrication and installation must comply with requirements of standards referenced in Section 1.04, Quality Assurance.

2.02 MATERIALS

- A. Steel:
 - 1. Exterior Doors and Frames: Galvanized Carbon Sheet Steel, Commercial Quality, A60 zinc coating (0.30 ounces per square foot per side), ASTM A653.
 - 2. Interior Doors and Frames: Cold-Rolled Steel Sheets, Commercial Quality Carbon Steel, ASTM A1008.

3. Steel shall be free of scale, pitting, coil breaks or other surface blemishes, and free of buckles, waves or other defects.
 4. Steel thicknesses expressed in steel gages (MSG) is for reference only. Actual steel thicknesses must meet minimum requirements of ASTM standards and as described in ANSI/SDI A250.8.
- B. Supports and Anchors: Fabricate from a minimum 16 gauge galvanized sheet steel unless noted otherwise.
- C. Fasteners: Provide as shown on Drawings and to suit conditions of secure installations. Furnish 304 Grade stainless steel types at exterior doors.
- D. Door Louvers (prohibited at protected openings):
1. Louver free air flow shall be 50% free area.
 2. Louvers for exterior doors shall be galvanized and furnished with not less than 12 gage frame and security grille welded to 18 gage steel blades, fully galvanized, with removable galvanized or bronze insect screen on inside. Install louver with tamperproof-head through-bolts. Anemostat PLSL, Air Louvers Inc. Model 1500-A, L & L Louvers, or equal.
 3. Louvers shall be comply with SDI 111C and be furnished with factory primer.
- E. Vision panels: Manufacturer's standard, U.L. approved, finished flush with door face, with no visible fasteners on either door face.
- F. Shop Paint:
1. Conform to Steel Structures Painting Council (SSPC) for steel components.
 2. Pretreatment/priming coatings shall be compatible with Project site finish painting system in accordance with Section 09 9000.
 3. At frames to be grouted, surfaces that are inaccessible after installation shall be coated with bituminous or asphaltic base paint.

2.03 FABRICATION GENERAL

- A. General: Fabricate hollow metal units to be rigid, neat in appearance, and free from defects including warp or buckle.
1. Accurately form metal to required sizes and profiles. Fit and assemble units in manufacturer's plant. Where practical, factory or shop fit and assemble units for shipment.

2. Weld joints continuously; grind, dress, and make smooth, flush, and invisible. Filler to conceal manufacturing defects or damage is not permitted.
3. Corner Joints: Finish corner joints by mitering, or coping and butting, or a combination of both. Trim and backbend shall be continuous around corner.
4. Continuously weld joints for full depth and width of frame, trim, and backbends.
5. Clearances for Fire-Rated Doors: As required by NFPA 80.

2.04 FRAMES

- A. General: Provide fully welded steel frames with integral stops and trim for doors, transoms, sidelights, borrowed lights, and other openings, and with details indicated for type and profile. Use concealed fastenings, unless otherwise indicated.
- B. Metal Thickness of Frames (minimum):
 1. Interior hollow metal frames up to 4-foot wide 16 gage
 2. Interior hollow metal frames wider than 4-foot 14 gage
 3. Exterior hollow metal frames 14 gage
 4. Borrowed lights up to 4-foot wide 16 gage
- C. Supports and Anchors: Fabricate from at least 16-gage, galvanized steel sheet. Frame anchors shall comply with fire rated label requirements of opening.
 1. Floor Anchors:
 - a. Minimum thickness: 12 gage galvanized steel sheet or bent steel plate, securely fastened inside each jamb, with two holes in anchor at each jamb for 3/8 inch floor anchorage fasteners. For preframed wood stud walls provide an additional wood stud anchor located as close to the bottom of the jamb as is practical.
 - b. Where required at sloping and uneven floor conditions, or to coordinate adjustments for trim alignments, provide adjustable floor anchors, providing at least 2-inch height adjustments.
 2. Jamb Anchors:
 - a. Locate anchors near top and bottom and at intermediate points not to exceed 24 inches on center. Provide two anchors per head for openings up to 48 inches wide; over 48 inches wide provide anchors at 24 inches on center maximum.

- b. Anchors in masonry construction: Provide manufacturers standard jamb anchors. Steel wire complying with ASTM A510, 0.177 inch in diameter, may be furnished.
 - c. Anchors in Stud Partitions: Provide steel anchors, 16 gage minimum sheet steel, of design to suit partition construction, securely welded inside each jamb.
 - d. Through-Frame Anchors: At frames indicated to be anchored with bolts through frame, provide countersunk holes for bolts with 16 gauge minimum sheet steel stiffeners full thickness of frame, and securely welded inside each frame at each hole.
- D. Inserts, Bolts, and Fasteners: Provide manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A153 Class C or D as required.
- E. Head Reinforcing: Refer to Detail #2 of this section. Reinforcing shall not act as lintel or load-carrying member and shall comply with fire rating requirements. Provide at frames regardless of whether a closer is called for.
- F. Hardware Reinforcement and Accessories:
- 1. Butt Hinge: 7 gage minimum.
 - 2. Continuous hinge: 14 gage continuous strip reinforcing.
 - 3. Head assemblies: Reinforced internally with, full length, 10 gage angles on each side of frame and bar at bottom of stop for closer reinforcement in frames as shown in Detail #2 of this section.
 - 4. Reinforcing for other items of finish hardware shall be accomplished according to ANSI A250.6.
 - 5. Plaster Guards: Provide 26 gage galvanized steel plaster guards or dust cover boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.
- G. Mullion and Transom bars: Furnished and fabricated as specified for frames.
- H. Glazed Openings: Applied stops with mitered or butted corners, of minimum 18 gage galvanized steel, one-piece lengths, secured within 3" of ends and at 12" centers with oval head countersunk tamper resistant screws. Corner joints shall be furnished with contact edges closed tight, with trim faces mitered and continuously welded. Frames for multiple openings shall be provided with mullion and/or rail members, fabricated of closed tubular shapes with no visible seams or joints. Joints between faces of

abutting members shall be securely welded and finished smooth. Provide condensate weeps 4 inches on centers, maximum.

- I. Door Silencers: Except for exterior doors, drill and punch frames for three silencers at lock jamb of single swing doors or in double doors with astragal and one silencer per leaf in heads of doubled door frames.
- J. Where frames are installed in walls sitting on a concrete curb, provide a closure plate or extend backbends to provide closure where frame abuts concrete curb.

2.05 DOORS

- A. General: Custom-made, flush-panel “seamless type” with one-piece face panels; continuous weld, seamless edge construction with no visible seams or joints on faces or on vertical edges.
 - 1. Provide type and size of doors shown with louvers and openings for glazing where indicated.
 - 2. Door thickness: 1 ¾ inches.
 - 3. Face Sheet Minimum Gage: 16 gage.
 - 4. Stiffeners: Stiffen door face sheets with continuous vertical-formed steel (rib) sections or back to back hat sections, minimum 20 gage, full thickness of interior space between door faces, spaced 6” on center maximum, and spot welded to both faces 4” on center maximum.
 - 5. Acoustical Insulation: Provide sound deadening and insulating material through entire core of door (full height, width, and thickness of door). Provide STC ratings where indicated on Drawings, scheduled, or for partition ratings indicated on Drawings.
 - a. Doors shall have a minimum STC of 28 as tested under ASTM E90 and ASTM E413, unless noted otherwise..
 - 6. Thermal Insulation: Exterior doors shall be insulated to R values scheduled or indicated on drawings.
 - 7. Labeled Doors: Where fire-rated openings and conditions are indicated.
 - a. Labeled doors shall be provided with fire-resistance rating indicated and shall be constructed as tested and approved by Underwriters’ Laboratories (UL) for installation in labeled frame and door assemblies.
 - b. Gaskets: Gaskets are supplied under Section 08 7100 - Door Hardware. Gaskets and installation shall conform to requirements of

CBC 716.5.3.1 and NFPA 105, "Installation of Smoke and Draft Control Door Assemblies."

- c. Fabricate labeled doors with same finished appearance as specified for non-labeled hollow metal doors; with welded door edges, filled and ground smooth; with label affixed to door.
 - d. Where fire labels are required and continuous hinge is specified, install label on top of door within 6" of hinge side of door.
8. Door Edges: Join door face sheets at vertical edges of door with continuous weld full height of door. Grind, fill, and dress welds smooth to provide invisible seam with smooth, flush surface.
- a. Close ends of doors with continuous recessed channels, 16 gage steel minimum, spot welded to both face sheets. Close top and bottom edges of doors with a internal steel channel, screw attached into top and bottom of door. Channel shall be galvanized at exterior doors. No screws are allowed on visible faces of door. Provide openings in bottom closure of exterior doors to permit escape of entrapped moisture.
 - b. Profile of Door Edges:
 - 1) Single-acting swing doors: Bevel both vertical edges 1/8" in 2".
 - 2) Pairs of single-acting swing doors: Bevel hinge edge 1/8" in 2". Provide surface mounted astragals for labeled or unlabeled doors unless otherwise shown on Drawings or required.
 - 3) Double-acting swing doors: Round both vertical edges on 2" minimum radius.
9. Door Louvers: Install according to manufacturers recommendations.
10. Glass Stops:
- a. Furnish fixed stops integral with and welded at security side of door.
 - b. Finish: Factory primer.
11. Transom: Fabricate to requirements specified for flush doors.
- K. Hardware Reinforcement and Accessories:
- 1. Provide sheet steel or plate reinforcement for finish hardware items wherever necessary. Mortise, drill and tap to template requirements for mortise type hardware.

2. Butt reinforcing: 7 gage minimum, of length 4" longer than length of butt. Minimum 3 spot welds at top and bottom.
3. Door closer reinforcement: 14 gage minimum steel channel, 6" high on each side of door.,. Reinforcement to extend full width of door in accordance with Detail #1 of this section.
4. Other Hardware Requirements: Cut, reinforce, drill, and tap doors and frames for other hardware, including energy management switches or contacts and security devices, in accordance with furnished hardware templates for accessory items. Thickness and size of reinforcement shall be as required by ANSI A250.6.

2.06 SHOP PRIMING

- A. Exposed and concealed metal surfaces of hollow metal doors, frames and other hollow metal Work of this Section shall be bonderized and then shop primed.
- B. Exposed surfaces of doors, frames and accessories shall be filled, sanded smooth and cleaned before painting.
- C. Exposed surfaces shall be shop primed after assembly.

PART 3 - EXECUTION

3.01 FRAME INSTALLATION

- A. Install steel frames accurately in location, perfect alignment, plumb, straight and true. Brace frames to prevent displacement.
- B. Anchor frames in concrete and concrete unit masonry with galvanized anchor bolts; 3/8 inch diameter, counter-sunk at 24 inches on center at head and jamb unless noted otherwise.
- C. Anchor frames in steel and wood frame partitions with manufacturer recommended anchors.
- D. Install frame at fire rated openings in accordance with NFPA Standard No. 80.
- E. Furnish filler for anchor attachment screws, and sand smooth.

3.02 DOOR INSTALLATION

- A. Install steel doors in accordance with manufacturer's instructions and as indicated on Drawings and in Finish Hardware Specifications. Coordinate with Work of other trades.

- B. Ensure that door and jamb clearances comply with requirements of ANSI/NFPA 80. When wood doors are being installed in metal frames constructed pursuant to this section, allowable door and jamb clearances shall be as specified in Specification Section 08 1416.
- C. Adjust operable parts for correct function.
- D. Remove hardware, except primer-coated items, tag, box and install after finish painting has been completed.

3.03 PRIME COAT TOUCH-UP

- A. Immediately after installation, remove rust, repair damaged surfaces to new condition, sand smooth, and install touch-up primer.

3.04 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

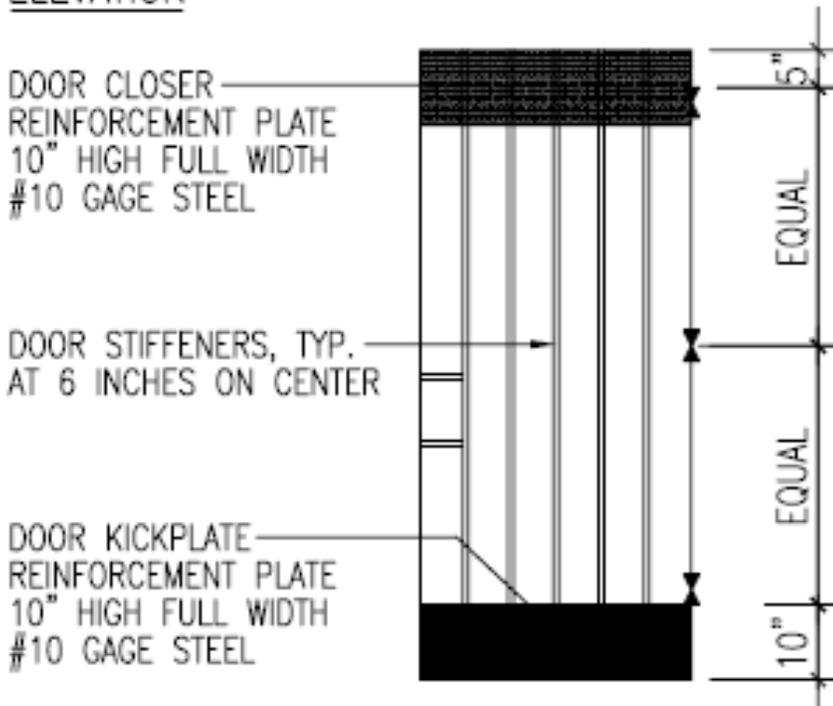
3.05 PROTECTION

- A. Protect Work of this section until Substantial Completion.

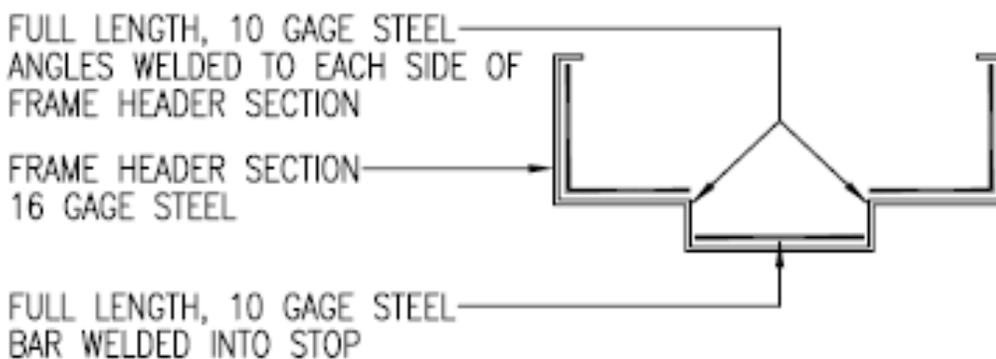
END OF SECTION

DETAIL # 1 - DOOR REINFORCEMENT

ELEVATION



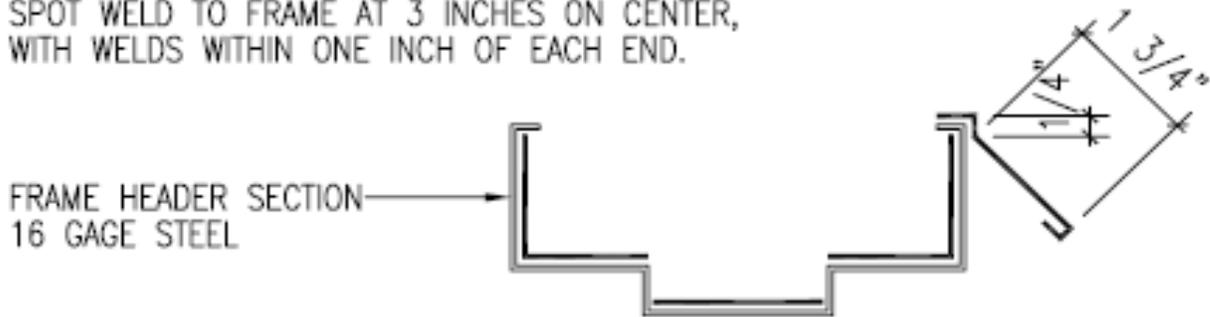
DETAIL # 1 - DOOR HARDWARE REINFORCEMENT
DOOR CLOSER REINFORCEMENT FOR ALL STEEL DOOR FRAMES



DETAIL # 3 - CONCRETE WALL CONDITION

DETAIL FOR EXTERIOR DOOR WHERE RAIN DRIP IS REQUIRED.
 EXTERIOR SIDE WITH 22 GAGE GLAVANIZED SHEET METAL OR PAINT LOCK
 RAIN DRIP WELDED IN PLACE.

SPOT WELD TO FRAME AT 3 INCHES ON CENTER,
 WITH WELDS WITHIN ONE INCH OF EACH END.



DETAIL # 3A - PLASTER WALL CONDITION

DETAIL FOR EXTERIOR DOOR WHERE RAIN DRIP IS REQUIRED.
 EXTERIOR SIDE WITH 22 GAGE GLAVANIZED SHEET METAL OR PAINT LOCK
 RAIN DRIP WELDED IN PLACE.

SPOT WELD TO FRAME AT 3 INCHES ON CENTER,
 WITH WELDS WITHIN ONE INCH OF EACH END.



SECTION 08 1416
FLUSH WOOD DOORS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Wood doors.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 08 1113 - Hollow Metal Doors and Frames
3. Section 08 7100 - Door Hardware.
4. Section 08 8000 - Glazing.
5. Section 09 9000 - Painting and Coating.

1.02 DESIGN REQUIREMENTS

A. Drawings indicate sizes, locations and general details of wood door construction and installation.

B. Regulatory Requirements:

1. Fire rated doors shall be listed by a nationally recognized testing and certification agency in accordance with local building codes and acceptable to the authorities having jurisdiction. The listed doors shall meet or exceed the requirements of UL10B, NFPA 252 and NFPA 80. All door requiring fire-rating shall carry either a UL or ITS (Intertek Testing Services-Warnock Hersey) label.
2. ASTM E2074 – Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure on Side-Hinged and Pivoted Swinging Door Assemblies.

1.03 SUBMITTALS

A. Shop Drawings: Submit schedules, plans, elevations and details indicating door construction details, opening identification symbols, sizes, door type and grade, fire classification, swing, light and louver cutout size and locations, and undercuts.

B. Product Data: Submit manufacturers technical data for each specified door type, including details of wood species, design and construction, factory finishing specifications and installation instructions.

- C. Construction Samples: Submit samples of not less than 6-inch by 6-inch for each type of door to be furnished, showing face, edge and core construction.
- D. Color/finish Samples: Submit samples of not less than 4-inch by 6-inch on representative door finish and samples of 3-inch by 8-inch for the exposed edges. Each sample shall bear a label identifying the job name, Architect, Contractor and the Woodwork Insitute finish system number.
- E. Certificates:
 - 1. Submit Certificate that solid core doors comply with all requirements of ANSI/WDMA I.S. 1-A.
 - 2. Submit certification that fire rated doors comply with CBC Section 715 or UL 10B.

1.04 QUALITY ASSURANCE

- A. Wood doors construction, manufacture, and fabrication shall conform to ANSI/WDMA I.S. 1-A, custom grade, extra heavy duty grade including the latest revisions, and special requirements specified.
- B. Doors shall be fabricated, hardware factory fitted and machined, and factory finished, unless noted otherwise.
- C. Wood Door Finishes shall comply with the North American Architectural Woodwork Standards (NAAWS) latest edition.
- D. Doors shall be products of one manufacturer.
- E. Door modifications are not permitted, unless reviewed by the OAR.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturers original, unopened, undamaged containers with identification labels intact.
- B. Deliver doors to the Project site only after building has been provided with design temperature and humidity.
- C. Store and handle in accordance with ANSI/WDMA I.S.1-A. Store doors protected from exposure to harmful conditions and at temperature and humidity conditions recommended by the manufacturer.

1.06 PROJECT CONDITIONS

- A. Do not install doors until building is enclosed and ambient conditions are within the temperature and humidity range to be expected during occupancy.

1.07 WARRANTY

- A. Manufacturer shall provide a two year material warranty for exterior doors.

- B. Manufacturer shall provide a life time material warranty for interior doors.
- C. Installer shall provide a two year fabrication and installation warranty for all doors.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Provide products manufactured by one of the following:
 - 1. Algoma Hardwood Inc.
 - 2. Brentwood Manufacturing.
 - 3. Eggers Industries.
 - 4. Mohawk Flush Door, Inc
 - 5. VT Industries, Inc.
 - 6. Western Oregon Door.
 - 7. Equal.

2.02 DOOR CONSTRUCTION

- A. Exterior Flush Doors:
 - 1. Exterior doors shall be furnished as follows:
 - a. Transparent Finished (Stained): NAAWS Custom grade, extra heavy duty grade, solid wood core, 5 ply, veneer faces, fully bonded to core.
 - b. Opaque Finished (Painted): NAAWS Custom grade extra heavy duty grade, solid wood core, 5 ply, medium density overlay faces, bonded to core.
 - 2. Staved Lumber Core shall be low density, thoroughly kiln-dried wood blocks not more than 2 ½-inches wide, with joints staggered, and random lengths.
 - 3. Edge strips: Shall be kiln-dried birch or maple
 - a. Transparent Finished Doors: Same species as face veneer or similar in overall color, grain, character and contrast as the face veneer.
 - b. Opaque Finished Doors: Close grain hardwood.
 - 4. Full stile edge strip shall be not less that 2 inches wide. Stiles shall be fully bonded to the core. The outer face stiles shall be full length ¾ inch birch or maple. The inner back stile shall be 1 ¼-inch, 2 ply of similar species which may have four finger joints well staggered or be full lengths.

5. Top rail shall be a minimum of 2 inches with a maximum of three plies. Bottom rail shall be a minimum of 5 inches with a maximum of 6 plies. The outer rail faces shall be full length 7/8 inch of same species as edge strips. The inner rails shall be full length of similar species. Rails shall be fully bonded to core.
6. Crossbanding: Doors shall be furnished with full width crossbanding of properly dried hardwood, 1/16 inch thick, with a density of 52 pounds or higher per cubic foot.
7. Face Veneer for Transparent Finished Doors: NAAWS Custom grade, veneer shall be Grade "A". Minimum thickness shall be 0.0277 inches before sanding and 0.020 inches after sanding of specified face veneer.
 - a. Veneer Species: Maple
 - b. Veneer Cut: Plain
 - c. Veneer Match: Book
 - d. Pairs: Matched
8. Opaque Finished Doors: Custom grade medium density overlay hardboard.
9. Adhesive and Bonding: Bonding between veneer plies of wood face panels, and between door faces, frame and core unit shall be fabricated with type I waterproof cross-linking emulsion PVA adhesive.
10. Openings: Openings for lights, louvers and grilles, shall be fabricated by manufacturer, or in a certified door service mill in accordance with manufacturer's details, and in compliance with approved testing agency.
11. Louvers:
 - a. Louvers for exterior doors shall be furnished with at least 12 gage frame and security grill welded to 18 gage steel blades, fully galvanized, with removable galvanized or bronze insect screen on inside. Install louver with tamperproof-head through-bolts: Anemostat PLSL, Air Louvers Inc. Model 1500-A, L & L Louvers, or equal.
 - b. Louvers shall be furnished with factory primer.
12. Vision Panels: Vision panels in exterior doors shall be framed with Security Grille Glass Stop: Anemostat SI-IS, Air Louvers Inc. VLF-SG, L & L Louvers, or equal. Install vision panels with tamperproof-head through bolts. Security Grille shall be supplied with manufacturer's standard baked-on enamel finish.
13. Security Grilles: Refer to Section 08 5656.

B. Interior Flush Doors:

1. Interior doors shall be furnished as follows:

- a. Transparent Finished (Stained): NAAWS Custom grade. Solid wood core, 5 ply, veneer faced, fully bonded to core.
 - b. Opaque Finished (Painted): Custom grade. Solid wood core, 5 ply, MDO hardboard face, fully bonded to core.
2. Edge strips: Kiln-dried birch, maple or other material as indicated.
 - a. Transparent Finished Doors: Same species as face veneer or similar in overall color, grain, character and contrast as the face veneer.
 - b. Opaque Finished Doors: Close grain hardwood.
 3. Full stile edge strip shall be not less than 1 ½ inches wide, two ply stile. Stiles shall be fully bonded to the core. The outer face stile shall be full length ¾ inch birch or maple. The inner back stile shall be ¾ inch of similar species which may have two finger joints fully bonded to core.
 4. Top and bottom edge rails shall be full length and may be of glued up stock of similar species as edge strip, white fir or douglas fir, minimum density 24.33 pounds or higher per cubic foot. Top rail shall be minimum of 2 inches. Bottom rail shall be minimum of 5 inches fully bonded to core.
 5. Crossbanding: Doors shall be furnished with full width crossbanding of properly dried hardwood or engineered fiber composite material, 1/16 inch thick, with a density of 52 pounds or higher per cubic foot.
 6. Face Veneer for Transparent Finished Doors: Custom grade, veneer shall be Grade "A". Minimum thickness shall be 0.0277 inches before sanding and 0.020 inches after sanding of specified face veneer.
 - a. Veneer Species: Maple
 - b. Veneer Cut: Plain
 - c. Veneer Match: Book
 - d. Pairs: Matched
 7. Opaque Finished Doors: Custom grade medium density overlay hardboard.
 8. Adhesive and Bonding: Bonding between veneer plies of wood face panel, and between door faces, frame and core unit shall be fabricated with type I or II waterproof adhesives for interior doors.
 9. Openings: Openings for lights, louvers and grilles shall be performed by the manufacturer, or in a certified door service mill in accordance with manufacturer's details, and in compliance with testing agency requirements.
 10. Louvers (prohibited at protected openings):

- a. Louvers for interior doors shall be furnished with at least 12 gage cold rolled steel frames and security grill welded to 18 gage blades: Anemostat PLSL, Air Louvers Inc. Model 1500-A, L & L Louvers, or equal.
 - b. Install louvers with tamperproof-head through bolts.
11. Vision Panels: Vision panels in fire labeled doors shall be limited to 100 square inches and be framed with FGS-75 Fire Glass Stop by Anemostat, Air Louvers Inc. Model VLF, or equal and shall be State Fire Marshall listed. Frame shall be supplied with manufacturer's standard baked-on enamel finish. Install with tamperproof-head through bolts.

C. Fire Rated Doors:

1. Fire doors must meet the requirements of recognized fire door tests and bear certifying labels of an approved independent testing agency.
2. With exception to the requirements that would adversely affect the fire rating, rated doors shall meet the specifications listed in this section.
3. Door shall be constructed that when installed as an assembly and tested it will pass ASTM E2074 "Standard Test Method for Fire Test of Door Assemblies Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies," and can be rated as required.
4. Reinforcement Blocking: Provide hardware reinforcement blocking of size as required to secure specified hardware. Reinforcement blocking shall be in compliance with the manufacturer's labeling requirements and shall not be of mineral material.

2.03 FINISHING:

A. FACTORY FINISHING:

1. Factory finishing shall be NAAWSI Custom Grade and include all necessary preparation, materials and labor to provide an [Opaque] [Clear Transparent] [Stained Transparent] finish.
2. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
3. Finish: NAAWS [System 5, conversion varnish] [System 9, UV curable, acrylated epoxy, polyester, or urethane] [System 10, UV curable, water based] [or] [System 11, catalyzed polyurethane].
4. Staining: [Match Architect's sample] [As selected by Architect from manufacturer's full range] [None required].
5. Effect: [Open-grain finish] [Filled finish] [Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores].

6. Sheen: [Satin] [Semigloss].

B. JOB SITE FINISHING:

1. Doors indicated to be job site finished shall be factory back primed.

a. Doors Scheduled for Opaque Paint finish: Prime with one coat of wood primer indicated on Section 09 9000 - Painting and Coating.

b. Doors Schedules for Transparent Finish: Prime with stain and first coat of finish as indicated in Section 09 9000 - Painting and Coating.

2. Door Finish: Per Section 09 9000 - Painting and Coating.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install Work of this section as specified in ANSI/WDMA I.S. 1-A. Install fire doors in accordance with NFPA 80.

B. Provide each door accurately cut, trimmed, and fitted to its frame and hardware. Clearance at lock and hanging stile and at top shall not exceed 1/8 inch, and bottom shall not exceed 1/4 inch except where otherwise indicated. Arises shall be rounded to a 1/16 inch radius, and lock rail edges shall be slightly beveled. Screws for hardware shall not be driven but screwed into pre-drilled holes.

C. Doors shall operate freely, but not loosely, without sticking or binding, without hinge-bind conditions and with hardware properly adjusted and functioning.

3.02 CLEAN UP

A. Remove rubbish, waste and debris and legally dispose of off the Project site.

3.03 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 08 3116
ACCESS PANELS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Steel access panels, except those specified under Divisions 22 - Plumbing, 23 - HVAC, or 26 - Electrical.

B. Related Sections:

1. Division 01 - General Requirements.
2. Section 09 2423 - Cement Plaster and Metal Lath.
3. Section 09 2900 - Gypsum Board.
4. Section 09 3000 - Ceramic Tiling.
5. Section 09 9000 - Painting and Coating.
6. Division 22 - Plumbing.
7. Division 23 - HVAC.
8. Division 26 - Electrical.
9. Division 27 - Communications.

1.02 SUBMITTALS

A. Shop Drawings:

1. Indicate sizes, materials, thickness, fabrication methods, panel door and frame reinforcement, anchorage, and installation details.
2. Provide layout drawings, indicating dimensioned locations of proposed access panels, size of each panel, and installation details. Determine and indicate required access panels in finished surfaces, whether furnished under this section or as part of Work of Divisions 22-Plumbing, 23- HVAC, and 26-Electrical.

1.03 QUALITY ASSURANCE

- A. Panels shall be provided with UL listings and labels.

- B. Access panels and frames shall be products of one manufacturer.
- C. Coordinate access panels with plumbing, HVAC, and electrical work.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Panels and Frames: Provide protection as required by manufacturer to protect panels from damage during storage.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Access Panels:

<u>Non-Rated</u>	<u>Milcor</u>	<u>Karp</u>	<u>Nystrom</u>
Ceramic Tile	MS	DSC214M	NT
Plaster	K	DSC214M	NP
Drywall, Plaster Veneer	DW	DSC214M	NW
<u>Fire Rated</u>			
Ceramic Tile	MS	KRP150FR	IT
Plaster	M	KRP150PR	IP
Drywall, Plaster Veneer	M	KRP150FR	IW

Equal.

- B. Unless otherwise indicated, provide brushed stainless steel finish for panels installed in ceramic tile. Provide prime coat finish suitable for field painting for panels installed in other finishes.
- C. Access Panels shall be 18 gage minimum with vandal-proof lock operated by Allen wrench or other special tool. Exposed fastenings shall be secured with vandal-proof screws.

PART 3 - EXECUTION

3.01 GENERAL

- A. Provide access panels in finish construction, where indicated on Drawings, wherever required for access to concealed mechanical and electrical equipment, and where required by codes. Panels indicated on architectural Drawings shall be furnished under this section. Required panels for access to equipment, but not indicated on architectural Drawings, shall be furnished as part of Work requiring access.

3.02 INSTALLATION

- A. Install panels accurately in location, perfect alignment, plumb, straight and true. Brace to prevent displacement by adjacent Work.

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- B. Examine panels after installation for proper opening, closing and clearances. Replace damaged or defective panels.

3.03 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

3.04 PROTECTION

- A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Door hardware.
 2. Cylinders for doors fabricated with locking hardware.
- B. Related Divisions:
1. Division 06 – door hardware installation
 2. Division 07 – Section “Joint Sealants” for sealant requirements applicable to threshold installation specified in this section
 3. Division 08 – metal doors and frames, wood doors.
- C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.
1. Windows.
 2. Cabinets, including open wall shelving and locks.
 3. Signs.
 4. Toilet accessories, including grab bars.
 5. Installation.
 6. Rough hardware.
 7. Conduit, junction boxes & wiring.
 8. Access doors and panels.

1.2 REFERENCES:

- A. Use date of standard in effect as of Bid date.
1. American National Standards Institute
 - a) ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties.
 - b)
 2. BHMA – Builders Hardware Manufacturers Association
 3. 2022 California Building Code
 - a) Chapter 11B – Accessibility To Public Buildings, Public Accommodations, Commercial Buildings and Public Housing
 4. DHI – Door and Hardware Institute
 5. UL – Underwriters Laboratories
 - a) UL 305 – Panic Hardware
 6. WHI – Warnock Hersey Incorporated State of California Building Code
 7. Local applicable codes
 8. SDI – Steel Door Institute
 9. WI – Woodwork Institute
 10. AWI – Architectural Woodwork Institute
 11. NAAMM – National Association of Architectural Metal Manufacturers

- B. Abbreviations
 - 1. Manufacturers: see table at 2.1.A of this section
 - 2. Finishes: see 2.7 of this section.

1.3 SUBMITTALS & SUBSTITUTIONS

- A. SUBMITTALS: Submit electronic copy of schedule. Organize vertically formatted schedule into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Minimum 10pt font size. Include following information:
 - 1. Type, style, function, size, quantity and finish of hardware items.
 - 2. Use BHMA Finish codes per ANSI A156.18.
 - 3. Name, part number and manufacturer of each item.
 - 4. Fastenings and other pertinent information.
 - 5. Location of hardware set coordinated with floor plans and door schedule.
 - 6. Explanation of abbreviations, symbols, and codes contained in schedule.
 - 7. Mounting locations for hardware.
 - 8. Door and frame sizes, materials and degrees of swing.
 - 9. List of manufacturers used and their nearest representative with address and phone number.
 - 10. Catalog cuts.
- B. Bid and submit manufacturer's updated/improved item if scheduled item is discontinued.
- C. Deviations: Highlight, encircle or otherwise identify deviations from "Schedule of Finish Hardware" on submittal with notations clearly designating those portions as deviating from this section.
- D. If discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, note the discrepancy in the submittal and request direction from Architect for resolution.
- E. Substitutions per Division 1. Include product data and indicate benefit to the Project. Furnish operating samples on request.
- F. Items listed with no substitute manufacturers have been requested by Owner to meet existing standard.
- G. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, riser and point-to-point wiring diagrams, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

1.4 QUALITY ASSURANCE:

- A. Qualifications:
 - 1. Hardware supplier: direct factory contract supplier who employs a hardware consultant, available at reasonable times during course of work for project hardware consultation to Owner, Architect and Contractor.
 - a) Responsible for detailing, scheduling and ordering of finish hardware. Detailing implies that the submitted schedule of hardware is correct and complete for the intended function and performance of the openings.

- B. Hardware: Free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.
- C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.
- D. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions and code requirements.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Delivery: coordinate delivery to appropriate locations (shop or field).
 - 1. Permanent keys and cores: secured delivery direct to Owner's representative.
- B. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.
- C. Storage: Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc.

1.6 PROJECT CONDITIONS AND COORDINATION:

- A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.
- B. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents. Furnish related trades with the following information:
 - 1. Location of embedded and attached items to concrete.
 - 2. Location of wall-mounted hardware, including wall stops.
 - 3. Location of finish floor materials and floor-mounted hardware.
 - 4. At masonry construction, coordinate with the anchoring and hollow metal supplier prior to frame installation by placing a strip of insulation, wood, or foam, on the back of the hollow metal frame behind the rabbet section for continuous hinges, as well as at rim panic hardware strike locations, silencers, coordinators, and door closer arm locations. When the frame is grouted in place, the backing will allow drilling and tapping without dulling or breaking the installer's bits.
 - 5. Coordinate: flush top rails of doors at outswinging exteriors, and throughout where adhesive-mounted seals occur.
 - 6. Manufacturers' templates to door and frame fabricators.
- C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.

- D. Environmental considerations: segregate unused recyclable paper and paper product packaging, uninstalled metals, and plastics, and have these sent to a recycling center.
- E. Prior to submittal, carefully inspect existing conditions to verify finish hardware required to complete Work, including sizes, quantities, existing hardware scheduled for re-use, and sill condition material. If conflict between the specified/scheduled hardware and existing conditions, submit request for direction from Architect. Include date of jobsite visit in the submittal.
- F. Submittals prepared without thorough jobsite visit by qualified hardware expert will be rejected as non-compliant.

1.7 WARRANTY:

- A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' written warranties.
- B. Include factory order numbers with close-out documents to validate warranty information, required for Owner in making future warranty claims:
- C. Minimum warranties:

1. Mortise Locksets:	Ten years mechanical Three years electrical
2. Extra Heavy-Duty Cylindrical Lock:	Ten years mechanical Three years electrical
3. Stand Alone Electric Locks	One year
4. Exit Devices:	Ten years mechanical Three years electrical
5. Closers:	Thirty years mechanical Two years electrical
6. Hinges:	One year
7. Other Hardware	Two years

1.8 COMMISSIONING:

- A. Conduct these tests prior to request for certificate of substantial completion:
 - 1. With installer present, test door hardware operation with climate control system and stairwell pressurization system both at rest and while in full operation.
 - 2. With installer, access control contractor and electrical contractor present, test electrical, electronic and electro-pneumatic hardware systems for satisfactory operation.

1.9 REGULATORY REQUIREMENTS:

- A. Locate latching hardware between 34 inches to 44 inches above the finished floor, per-2022 California Building Code, Section 11B-404.2.7.
 - 1. Panic hardware: locate between 36 inches to 44 inches above the finished floor.

- B. Handles, pull, latches, locks, other operable parts:
 - 1. Readily openable from egress side with one hand and without tight grasping, tight pinching, or twisting of the wrist to operate. 2022 California Building Code Section 11B-309.4.
 - 2. Force required to activate the operable parts: 5.0 pounds maximum, per 2022 California Building Code Section 11B-309.4.
- C. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per 2022 California Building Code Section 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15-pounds.
 - 1. Exception: exterior doors' pressure-to-open may be increased to 8.5-pounds if: at a single location, and one of a bank of eight leaves or fraction of eight, and one leaf of this bank is fitted with a low- or high-energy operator.
- D. Adjust door closer sweep periods so that from an open position of 90 degrees, the door will take at least 5 seconds to move to a point 12 degrees from the latch, measured to the landing side of the door, per 2022 California Building Code Section 11B-404.2.8.
 - 1. Spring hinges: adjust for 1.5 seconds minimum for 70 degrees to fully-closed.
- E. Smooth surfaces at bottom 10 inches of push sides of doors, facilitating push-open with wheelchair footrests, per 2022 California Building Code Section 11B-404.2.10.
 - 1. Applied kickplates and armor plates: bevel the left and right edges; free of sharp or abrasive edges.
 - 2. Tempered glass doors without stiles: bottom rail may be less than 10 inches if top leading edge is tapered 60 degrees minimum.
- F. Door opening clear width no less than 32 inches, measured from face of frame stop, or edge of inactive leaf of pair of doors, to door face with door opened to 90 degrees. Hardware projection not a factor in clear width if located above 30 inches and below 80 inches, and the hardware projects no more than 4 inches. 2022 California Building Code Section 11B-404.2.3.
 - 1. Exception: In alterations, a projection of 5/8 inch (15.9 mm) maximum into the required clear width shall be permitted for the latch side stop.
 - 2. Door closers and overhead stops: not less than 78 inches above the finished floor or ground, per 2022 California Building Code 11B-307.4.
- G. Thresholds: floor or landing no more than 0.50 inches below the top of the threshold of the doorway, per 2022 California Building Code Section 11B-404.2.5. Vertical rise no more than 0.25 inches, change in level between 0.25 inches and 0.50 inches: beveled to slope no greater than 1:2 (50 percent slope). 2022 California Building Code Section 11B-303.2 & ~.3.
- H. Floor stops: Do not locate in path of travel. Locate no more than 4 inches from walls, per DSA Policy #99-08 (Access).
- I. Pairs of doors with independently-activated hardware both leaves: limit swing of right-hand or right-hand-reverse leaf to 90 degrees to protect persons reading wall-mounted tactile signage, per 2022 California Building Code Section 11B-703.4.2.

PART 2 PRODUCTS

2.1 MANUFACTURERS:

A. Listed acceptable alternate manufacturers: these will be considered; submit for review products with equivalent function and features of scheduled products.

ITEM:	MANUFACTURER:	ACCEPTABLE ALTERNATE:
Hinges	(IVE) Ives	Bommer
Key System	(CYB) Cyberkey/Videx	Owner standard
Mechanical Locks	(SCH) Schlage	Owner standard
Electronic Locks	(SCE) Schlage Electronics	Owner standard
Exit Devices	(VON) Von Duprin	Owner standard
Closers	(LCN) LCN	Owner standard
Kickplates	(IVE) Ives	Rockwood, Trimco
Stops & Holders	(IVE) Ives	Rockwood, Trimco
Thresholds	(ZER) Zero	NGP, Pemko
Seals & Bottoms	(ZER) Zero	NGP, Pemko

2.2 HINGING METHODS:

- A. Drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening. Advise architect if 8-inch width is insufficient.
- B. Conform to manufacturer's published hinge selection standard for door dimensions, weight and frequency, and to hinge selection as scheduled. Where manufacturer's standard exceeds the scheduled product, furnish the heavier of the two choices, notify Architect of deviation from scheduled hardware.
- C. Conventional Hinges: Steel or stainless-steel pins and approved bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.
 - 1. Out-swinging exterior doors: non-ferrous with non-removable (NRP) pins and security studs.
 - 2. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.

2.3 LOCKSETS, LATCHSETS, DEADBOLTS:

- A. Mortise Locksets and Latchsets: as scheduled.
 - 1. Chassis: cold-rolled steel, handing field-changeable without disassembly.
 - 2. Universal lock case – 10 functions in one case.

3. Floating mounting tabs automatically adjusts to fit a beveled door edge.
4. Latchbolts: 0.75 inch throw stainless steel anti-friction type.
5. Lever Trim: through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.
 - a) Spindles: security design independent breakaway. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.
 - b) Inside lever applied by screwless shank mounting – no exposed trim mount screws.
 - c) Levers rotate up or down for ease of use.
6. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.
7. Turnpieces: accessible offset turn-lever design not requiring pinching or twisting motions to operate.
8. Deadbolts: stainless steel 1-inch throw.
9. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.
10. Scheduled Lock Series and Design: Schlage L series, 06A design.
11. Certifications:
 - a) ANSI A156.13, 1994, Grade 1 Operational.
 - b) ANSI/ASTM F476-84 Grade 31 UL Listed.
12. Accessibility: Require not more than 5 lb to retract the latchbolt or deadbolt, or both, per CBC 2022 11B-404.2.7 and 11B-309.4.
13. Accepted substitutions: None.

B. Extra Heavy Duty Cylindrical Locks and Latches: as scheduled.

1. Chassis: cylindrical design, corrosion-resistant plated cold-rolled steel, through-bolted.
2. Locking Spindle: stainless steel, integrated spring and spindle design.
3. Latch Retractors: forged steel. Balance of inner parts: corrosion-resistant plated steel, or stainless steel.
4. Latchbolt: solid steel.
5. Backset: 2.75 inches typically, more or less as needed to accommodate frame, door or other hardware.
6. Lever Trim: accessible design, independent operation, spring-cage supported, minimum 2.00 inches clearance from lever mid-point to door face.
7. Strikes: 16 gage curved steel, bronze or brass with 1.00 inch deep box construction, lips of sufficient length to clear trim and protect clothing.
8. Lock Series and Design: Schlage ND series, "Rhodes" design.
9. Certifications:
 - a) ANSI A156.2, Series 4000, Grade 1.
 - b) UL listed for A label and lesser class single doors up to 4 feet x 8 feet.
10. Accessibility: Require not more than 5 lb to retract the latchbolt or deadbolt, or both, per CBC 2022 11B-404.2.7 and 11B-309.4
11. Accepted substitutions: None.

2.4 EXIT DEVICES / PANIC HARDWARE

A. General features:

1. Independent lab-tested 1,000,000 cycles.
2. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
3. Deadlocking latchbolts, 0.75 inch projection.
4. End caps: impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.
5. No exposed screws to show through glass doors.
6. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
7. Releasable in normal operation with 15-pound maximum operating force per UBC Standard 10-4, and with 32-pound maximum pressure under 250-pound load to the door.
8. Accessibility: Require not more than 5 lb to retract the latchbolt, per CBC 2022 11B-404.2.7 and 11B-309.4.
 - a) Mechanical method: Von Duprin "AX-" feature, where touchpad directly retracts the latchbolt with 5 lb or less of force. Provide testing lab certification confirming that the mechanical device is independent third-party tested to meet this 5 lb requirement.

B. Specific features:

1. Non-Fire Rated Devices: cylinder dogging with security indicator.
2. Lever Trim: breakaway type, forged brass or bronze escutcheon min. 0.130 inch thickness, compression spring drive, match lockset lever design.
3. Fire-Labeled Devices: UL label indicating "Fire Exit Hardware". Vertical rod devices less bottom rod (LBR) unless otherwise scheduled.
4. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key. Furnish storage brackets for securely stowing the mullion away from the door when removed.
5. Accepted substitutions: None.

2.5 CLOSERS

A. Surface Closers: 4040XP

1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast-iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
2. ISO 2000 certified. Units stamped with date-of-manufacture code.
3. Independent lab-tested 10,000,000 cycles.
4. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
6. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per 2022 California Building Code Section 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15-pounds.

- a) Exception: exterior doors' pressure-to-open may be increased to 8.5-pounds if: at a single location, and one of a bank of eight leaves or fraction of eight, and one leaf of this bank is fitted with a low- or high-energy operator.
- 7. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
- 8. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
- 9. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
- 10. Exterior doors: seasonal adjustments not required for temperatures from 120 degrees F to -30 degrees F, furnish checking fluid data on request.
- 11. Non-flaming fluid, will not fuel door or floor covering fires.
- 12. Pressure Relief Valves (PRV) not permitted.
- 13. Accepted substitutions: None.

2.6 OTHER HARDWARE

- A. Kick Plates: Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.
- B. Door Stops: Provide stops to protect walls, casework or other hardware.
 - 1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where floor type cannot be used, provide wall type. If neither can be used, provide overhead type.
 - 2. Locate overhead stops for maximum possible opening. Consult with Owner for furniture locations. Minimum: 90deg stop / 95deg deadstop. Note degree of opening in submittal.
- C. Seals: Four-fingered type at head & jambs. Inelastic, rigid back, not subject to stretching. Self-compensating for warp, thermal bow, door settling, and out-of-plumb. Adhesive warranted for life of installation.
 - 1. Proposed substitutions: submit for approval.
 - 2. Three-fingered type at hinge jambs of doors fitted with continuous hinges where jamb leaf of hinge is fastened to the frame reveal.
- D. Thresholds: As scheduled and per details. Comply with CBC 2022 11B-404.2.5. Substitute products: certify that the products equal or exceed specified material's thickness. Proposed substitutions: submit for approval.
 - 1. Saddle thresholds: 0.125 inches minimum thickness.
 - 2. Exteriors: Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Minimum 0.25 inch diameter fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors. National Guard Products' "COMBO" or Pemko Manufacturing's "FHSL".
 - 3. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.
 - 4. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression.

- E. Through-bolts: Do not use. Coordinate with wood doors; ensure provision of proper blocking to support wood screws for mounting panic hardware and door closers. Coordinate with metal doors and frames; ensure provision of proper reinforcement to support machine screws for mounting panic hardware and door closers.
 - 1. Exception: surface-mounted overhead stops, holders, and friction stays.

2.7 FINISH:

- A. Generally: BHMA 626 Satin Chromium.
 - 1. Areas using BHMA 626: furnish push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise scheduled.
- B. Door closers: factory powder coated to match other hardware, unless otherwise noted.

2.8 KEYING REQUIREMENTS:

- A. Key System: existing Videx system. Initiate and conduct meeting(s) with Owner to determine system structure, furnish Owner's written approval of the system; do not order keys or cylinders without written confirmation of actual requirements from the Owner. Furnish temporary construction-keyed and permanent cylinders. Contractor to demonstrate to the Owner that temporary keys no longer operate the locking cylinders at the end of the project.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS:

- A. Can read and understand manufacturers' templates, suppliers' hardware schedule and printed installation instructions. Can readily distinguish drywall screws from manufacturers' furnished fasteners. Available to meet with manufacturers' representatives and related trades to discuss installation of hardware.

3.2 PREPARATION:

- A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation. Installation denotes acceptance of wall/frame condition.
- A. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.
 - 1. Notify Architect of code conflicts before ordering material.
 - 1. Locate latching hardware between 34 inches to 44 inches above the finished floor, per California Building Code, Section 1008.1.9.2 and 11B-404.2.7.
 - 2. Locate panic hardware between 36 inches to 44 inches above the finished floor.
 - 3. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.

4. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.

3.3 INSTALLATION

- A. Install hardware per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.
 1. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.
 2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws
 3. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.
 4. Replace fasteners damaged by power-driven tools.
- B. Locate floor stops no more than 4 inches from walls and not within paths of travel. See paragraph 2.2 regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.
- C. Locate overhead stops for minimum 90 degrees at rest and for maximum allowable degree of swing.
- D. Drill pilot holes for fasteners in wood doors and/or frames.
- E. Where existing wall conditions will not allow door to swing using the scheduled hinges, provide wide-throw hinges and if needed, extended arms on closers.
- F. Provide manufacturer's recommended brackets to accommodate the mounting of closers on doors with flush transoms.

3.4. ADJUSTING

- A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.
 1. Hardware damaged by improper installation or adjustment methods: repair or replace to Owner's satisfaction.
 2. Adjust doors to fully latch with no more than 1 pound of pressure.
 - a) Door closer valves: turn valves clockwise until at bottom – do not force. Turn valves back out one and one-half turns and begin adjustment process from that point. Do not force valves beyond three full turns counterclockwise.
 3. Adjust door closers per 1.9 this section.

- B. Inspection of fire door assemblies and means-of-egress panic-hardware doors:
Per 2022 NFPA-80 5.2.1: hire an independent third-party inspection service to prepare a report listing these doors, and include a statement that there are zero deficiencies with the fire-rated assemblies and the openings with panic hardware.
- C. Final inspection: Installer to provide letter to Owner that upon completion installer has visited the Project and has accomplished the following:
 - 1. Has re-adjusted hardware.
 - 2. Has evaluated maintenance procedures and recommend changes or additions and instructed Owner's personnel.
 - 3. Has identified items that have deteriorated or failed.
 - 4. Has submitted written report identifying problems.

3.5 DEMONSTRATION:

- A. Demonstrate mechanical hardware and electrical, electronic and pneumatic hardware systems, including adjustment and maintenance procedures.

3.6 PROTECTION/CLEANING:

- A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.
- B. Clean adjacent wall, frame and door surfaces soiled from installation / reinstallation process.

3.7 SCHEDULE OF FINISH HARDWARE

- A. See door schedule in drawings for hardware set assignments.
- B. Do not order material until submittal has been reviewed, stamped, and signed by Architect's door hardware consultant.
- C. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

Opt. #: OPT0366525-V1

HARDWARE GROUP NO. 01

Provide each SGL door(s) with the following:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD RHO	626	SCH
1	EA	PERMANENT CORE	VIDEX FSIC CORE AS REQUIRED	626	CYB
1	EA	FLOOR STOP	FS436/FS438 AS REQ'D	626	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

HARDWARE GROUP NO. 02

Provide each SGL door(s) with the following:

3	EA	HINGE	5BB1HW SH 4.5 X 4.5 NRP	630	IVE
1	EA	CLASSROOM LOCK	L9070T 06A	626	SCH
1	EA	PERMANENT CORE	VIDEX FSIC CORE AS REQUIRED	626	CYB
1	EA	LOCK GUARD	LG12	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA (OMIT @ OVERHANG)	AA	ZER
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	547A-223 OR AS DETAILED	A	ZER

HARDWARE GROUP NO. 03

Provide each SGL door(s) with the following:

3	EA	HINGE	5BB1HW SH 4.5 X 4.5 NRP	630	IVE
1	EA	ELEC PRIVACY LOCK	CO-200-MS-40-PRK-RHO-J 4B BATTERY OPERATED	626	SCE
1	EA	PERMANENT CORE	VIDEX FSIC CORE AS REQUIRED	626	CYB
1	EA	LOCK GUARD	LG12	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA (OMIT @ OVERHANG)	AA	ZER
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	547A-223 OR AS DETAILED	A	ZER

HARDWARE GROUP NO. 04

Provide each SGL door(s) with the following:

3	EA	HINGE	5BB1HW SH 4.5 X 4.5 NRP		630	IVE
1	EA	PANIC HARDWARE	CDSI-PA-AX-98-L-NL-06		626	VON
1	EA	MORTISE CYL TURN-CD	09-900 X XB11-720 XQ11-935 ADA T-TURN		626	SCH
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	PERMANENT CORE	VIDEX FSIC CORE AS REQUIRED		626	CYB
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS18L/FS18S AS REQ'D		BLK	IVE
1	EA	RAIN DRIP	142AA (OMIT @ OVERHANG)		AA	ZER
1	SET	GASKETING	429AA-S		AA	ZER
1	EA	DOOR SWEEP	8192AA		AA	ZER
1	EA	THRESHOLD	547A-223 OR AS DETAILED		A	ZER

END OF SECTION

SECTION 09 0561

MOISTURE TESTING FOR FLOORING INSTALLATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Moisture, alkali and bond testing of existing and new concrete slabs on grade and elevated slabs scheduled to receive adhered flooring.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 3000: Cast-in-Place Concrete; concrete slab curing.
3. Division 09 Finishes: Flooring Sections.

1.02 REFERENCES

A. ASTM International (ASTM):

1. ASTM D7234 – Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
2. ASTM F710 – Practice for Preparing Concrete Floors to Receive Resilient Flooring.
3. ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
4. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

1.03 TESTING REQUIREMENTS

A. Perform the following tests:

1. At new and existing concrete slabs on grade and below grade:
 - a. Moisture Vapor Emission Rate testing per ASTM F1869.
 - b. Relative Humidity testing per ASTM F2170.

- c. pH testing per ASTM F710.
 - d. Bond testing per D7234 or manufacturer recommendations.
2. At new and existing lightweight concrete elevated slabs:
- a. Relative Humidity testing per ASTM F2170.
 - b. pH testing per ASTM F710.
 - c. Bond testing per D7234 or manufacturer recommendations.
3. At new normal weight concrete elevated slabs:
- a. Moisture Vapor Emission testing per ASTM F1869.
 - b. Relative Humidity testing per ASTM F2170.
 - c. pH testing per ASTM F710.
 - d. Bond testing per D7234 or manufacturer recommendations.

1.04 SUBMITTALS

- A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; indicating:
 - 1. Moisture, humidity and pH limits.
 - 2. Manufacturer's bond/compatibility test procedure.
- B. Test Report: Submit on chart form with small scale floor plans showing the location of each test performed.
 - 1. Submit report for relative humidity test in accordance to ASTM F2170. Include pH, moisture vapor emission, and adhesion test results.
 - 2. Indicate areas where the test results exceed the floor covering manufacturer's limits and indicate proposed remediation procedures.

1.05 QUALITY ASSURANCE

- A. Tests indicated in this Section shall be performed by CONTRACTOR or a qualified independent testing agency retained and paid by CONTRACTOR. OWNER may perform testing at its own expense to compare to CONTRACTOR's test results.
- B. Testing kits:

1. Moisture-Vapor Emission: Prepackaged anhydrous calcium chloride test kits conforming to requirements of ASTM F-1869.
 2. Alkalinity: Calibrated digital pH meter in accordance with ASTM F-710.
 3. Relative Humidity: Relative humidity concrete moisture testing equipment conforming to ASTM F-2170.
- C. Chemically based products such as sealers, primers, fillers and adhesives, shall be approved by the OWNER's Office of Environmental Health and Safety (OEHS).

1.06 ENVIRONMENTAL CONDITIONS

- A. Project areas to be tested shall be at the same temperature and humidity expected during normal use. These temperature and humidity levels shall be maintained for 48 hours prior to, and during the testing. If this is not possible, temperature and relative humidity ranges shall be within ranges indicated in the applicable ASTM test method.

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 PREPARATION

- A. Testing shall take place after allowing concrete to dry for a minimum of 90 days.
- B. Prior to test placement, CONTRACTOR shall clean concrete slabs and have them free of foreign substances, such as residual adhesives, curing or hardening compounds, adhesive removers, sealers, paints and other foreign materials that might prevent adhesive bond. These materials shall be removed not less than 24 hours prior to the placement of the test kits. Testing when floor coverings have never been installed may waive the 24 hour wait period.
- C. The test site temperature and humidity shall be in conformance to Article "Environmental Conditions".
- D. Minimum number of tests: For Moisture Vapor Emission Rate, Relative Humidity and pH testing, provide three for the first 1,000 square feet of floor area, and at least one for each additional 1,000 square feet or fraction thereof.

3.02 MOISTURE VAPOR EMISSION TESTING (MVEP)

- A. MVEP testing shall be performed in accordance to ASTM F1869.

- B. Unless more stringent requirements are recommended by flooring manufacturer, the maximum allowable moisture release at time of flooring installation shall be three pounds per 24 hours per 1,000 square feet.
- C. Weigh test dish on site prior to start of test. Scale must report weight to 0.1 grams. Record weight and start time. Expose Calcium Chloride and set dish on concrete surface. Install test containment dome and allow test to proceed for 60 – 72 hours.
- D. Retrieve the test dish by carefully cutting through containment dome. Close and reseal test dish. Weigh test dish on site recording weight and stop time. Calculate and report results as "pounds of emission per 1,000 sq. ft. per 24 hours".
- E. In the event the MVEP value exceeds the value specified in this Article and the flooring manufacturer recommended limits, CONTRACTOR shall propose remediation to OWNER. In new concrete slab construction, remediation shall be at no cost to OWNER.

3.03 RELATIVE HUMIDITY TESTING

- A. Relative humidity testing shall be performed in conformance to ASTM F2170.
- B. Choose test areas where high moisture levels are suspected. Holes in new concrete slabs may be cast or drilled. Depth of holes shall be 40% of slab thickness for slabs drying only from the top, and 20% when drying from top and bottom, as indicated on ASTM F2170. Determine the concrete thickness of each type of slab to be tested and calculate depth of holes.
 - 1. Hole shall be drilled dry; do not use water for cooling or lubrication. Drill holes in the concrete and insert test liners. Hole shall not be more than 0.04 inches, or one millimeter, larger than the test liner.
 - 2. Before placing concrete, secure liner tube to formwork or steel reinforcing to avoid displacement during concrete placement, consolidation and finishing. Secure a solid rod into the liner and protruding slightly above the top of the liner to exclude fresh concrete from entering the liner.
- C. Clean the area around the hole with a vacuum cleaner and vacuum the dust out of the hole. Immediately, set the sleeve by tapping the sleeve into the hole with a hammer or mallet.
- D. Remove the sleeve plug and place probe into the sleeve assuring that it reaches the bottom of the test hole. Connect the probe lead wire to the meter, and turn meter on. Allow time for the probe to sit in the test sleeve to achieve moisture equilibrium before taking relative humidity readings. Probe shall be at the same temperature as the concrete before the reading. Check for drift and follow meter manufacturer recommendations.
- E. Record the relative humidity to the nearest percent and temperature to the nearest degree. Record location of hole within the structure and depth of probe. Use the relative humidity probe to measure the ambient air temperature and relative humidity above the

slab in the vicinity of the test location. Remove the liner and fill the hole with a cementitious patching compound.

- F. In the event the relative humidity exceeds 75% and the flooring manufacturer recommended limits, CONTRACTOR shall propose remediation to OWNER. In new concrete slab construction, remediation shall be at no cost to OWNER.

3.04 PH LEVEL TESTING

- A. Perform testing in accordance to ASTM F710, and at the same time as the vapor emission and relative humidity tests.
- B. Place several drops of water onto the concrete surface to form a puddle approximately 1" in diameter. Allow the water to set for 60 +/- 5 seconds. Dip the pH paper into the water and remove immediately, compare color to chart provided by paper supplier to determine pH reading. Record and report results.
- C. When using pH Pencil and pH Meters, follow the instrument manufacturer's instructions.
- D. The surface of the concrete should have a pH of 9 or less. In the event the pH exceeds this value and the flooring manufacturer recommended pH limits, CONTRACTOR shall propose remediation to OWNER. In new concrete slab construction, remediation shall be at no cost to OWNER.

3.05 BOND TEST

- A. Perform bond testing in accordance to ASTM D4541 or per manufacturer's recommendations.
- B. Select appropriate locations for the bond tests such as near walls or in light traffic areas. Spaced test samples approximately 50 feet apart throughout the designated installation area. Number of tests will be as determined by the recommended spacing of 50 feet.
- C. Use the flooring material and recommended adhesives. Install 3' x 3' panels using the exact techniques that will be used for the flooring installation. It is recommended that tests be spaced approximately 50 feet apart throughout the designated installation area. Tape edges of panels to prevent edge drying of adhesive. Protect test panel from traffic.
- D. After 72 hours of placing the flooring, remove tape and observe whether it is bonded tightly to the floor, by trying to lift the edges with a scraper or other means, or pull flooring from the subfloor by hand. Determine if bonding is suitable for flooring installation.
- E. At locations where membrane, primer, leveler or patch are applied, perform applicable bond testing recommended by flooring manufacturer to assure adequate bond of flooring to substrate.
- F. Success or failure shall be determined by visual interpretation and the amount of physical effort required to remove the floor covering. If the flooring material can be removed it will indicate failure of the bond test. If the flooring requires a great deal of effort to pull it

up, the bond test can be considered successful, providing no sign of moisture is found. In the event that bond failure occurs in new concrete slab construction, remediation shall be at no cost to OWNER.

3.05 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.06 PROTECTION

- A. Protect the Work of this section until installation of finish flooring.

END OF SECTION

SECTION 09 2216
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Non-structural metal framing.
2. Slotted system for positive attachment of metal studs to overhead structural elements for head of wall expansion joint movement (cyclic).

B. Related Requirements:

1. Division 01 - General Requirements.
3. Section 09 2423 - Cement Plaster and Metal Lath.
4. Section 09 2900 - Gypsum Board.

1.02 PROJECT REQUIREMENTS

A. Regulatory Requirements: Comply with DSA and CBC requirements.

B. Design Requirements:

1. Metal Studs: Studs for interior partitions shall be roll-formed channel or C-shapes.
2. Track: Stud track for floor and ceiling anchorage shall be channel configuration, sized to fit studs. Galvanized steel as manufactured for installation with specified metal studs.
3. Design: Design is based on minimum 5 pounds per square foot load applied perpendicular to walls. Deflection shall not exceed 1/240 under design load.

B. Performance Requirements:

1. The top track fire-rated assembly, when incorporated into stud systems and tested in conjunction with products specified in Sections 07 8116 and/or 07 8413, shall exhibit the following performance characteristics:
 - a. Cyclic System: When tested for cyclical movement, in accordance with UL 2079. Assembly shall achieve 500 cycles of wall movement at 35 to 40 cycles per minute.

- b. When subsequently tested for 1 and 2 hour fire-resistive rated construction, in accordance with ASTM E119 and ASTM E814, assembly shall conform to requirements for hose stream resistance.

1.03 SUBMITTALS

- A. Shop Drawings: Submit drawings showing framing, connection details, accessories and anchorage. Indicate location of assemblies and size and spacing of framing components.
- B. Product Data: Submit manufacturer's catalog data for each item proposed for installation.
- C. Certificates: Furnish manufacturer's certification that materials meet or exceed Specification requirements.

1.04 DEFINITIONS

- A. Cyclic Anchoring Method: A system which provides for positive attachment (as described in ASTM C754) of studs to upper track, and of track to overhead fluted deck, while permitting up to 1-inch of vertical movement.
- B. System: The application of the above products in their entirety as tested. There can be no intermixing of components unless specifically outlined in the appropriate test reports.

1.05 QUALITY ASSURANCE

- A. Coordinate with related Work to provide blocking for items mounted on finished surfaces and to provide allowances for pipes and other items inside partitions and walls.
- B. Comply with following as a minimum requirement:
 1. American Welding Society (AWS): Structural Welding Code Steel (D1.1); and Structural Welding Code Sheet Steel (D1.3).
 2. ASTM Standards:
 - a. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.
 - b. ASTM A1003 –Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
 - c. ASTM A641 – Standard Specification for Zinc Coated (Galvanized) Carbon Steel Wire.
 - d. ASTM C645 – Standard Specification for Non-Structural Steel Framing Members.

- e. ASTM C955 – Standard Specification for Load Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging, for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
 - f. ASTM C954 – Standard Specification for Steel Drill Screws for Application of Gypsum Panel Products or Metal Bases to Steel Studs From 0.033 Inch to 0.112 Inch in Thickness.
 - g. ASTM E1190 – Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members.
- C. Tolerances: Install walls and partitions on straight lines, plumb, free of twists or other defects, and contacting a 10 foot straightedge for its entire length at any location within a 1/8 inch tolerance. Install horizontal framing level within a tolerance of 1/8 inch in 12 feet in any direction.
- D. Manufacturers shall be members of Steel Stud Manufacturers Association (SSMA).

1.06 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered in their original unopened packages and stored protected from damage. Do not store material directly on grade. Provide adequate support to prevent bowing of material prior to installation.
- B. Store welding electrodes in accordance with AWS D12.1.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Non-structural metal framing:
 - 1. ClarkWestern Building Systems, Inc.
 - 2. Dietrich Industries, Inc.
 - 3. Marino/Ware.
 - 4. Cemco.
 - 5. Equal.
- B. Top Track Systems:
 - 1. Sliptrack System by Dietrich Industries., Inc. or equal. Down-standing legs shall be nominally 2 1/2-inch and shall be provided with 1 1/2-inch slots at 1 inch on center.
 - 2. VertiTrack or VertiClip System by The Steel Network, Inc. or equal. Pre-assembled track with clips installed to match stud spacing. Clips with attached bushing and screws to allow stud movement.

3. System must provide for minimum tested overall movement of 1 inch: ½ inch in each direction.
4. Track shall be provided in standard widths of 4 and 6 inches and in 16, 18, and 20 gage (54, 43, and 33 mil) sheet steel thickness, as required by Project conditions and detailed.

2.02 MATERIALS

A. Light Gage Metal Framing:

1. Metal framing shall be formed from corrosion resistant-steel conforming to requirements of ASTM A653, 33 ksi minimum.
2. Metal framing shall be zinc coated in conformance to requirements of ASTM A924, G60.
3. Metal framing shall be manufactured in conformance to ASTM C645.
4. Install metal framing according to ASTM C1007, Standard Specification for Installation of Load-Bearing (Transverse and Axial) Steel Studs and Related Accessories.

B. Studs: SSMA, ICC-ES ER-4943P, minimum yield 33 ksi, hot-dipped galvanized or electro galvanized sheet steel, G-60, C Stud type, punched web (except tracks and joists), C-shaped, sizes required to conform to details and scheduled wall thicknesses. Studs shall be rolled from new steel sheet and shall not be produced from re-rolled steel. Stud flanges shall not be less than 1 5/16-inch wide; track flanges, not less than 1 ¼-inch wide.

1. Wall Framing and Furring for Plaster and Mortar Beds: Studs and tracks shall be 18 gage (43 mil) minimum, unless otherwise indicated.
2. Wall Framing and Furring for Gypsum Wallboard: Studs and tracks shall be 20 gage (33 mils) minimum, unless otherwise indicated.
3. Load-Bearing Studs: Studs and members thicker than 18 gage (43 mil) shall conform to requirements of Section 05 4100 - Structural Metal Stud Framing.
4. Stud gages indicated on Drawings or specified are the minimum. Where required stud height and/or loads exceed code requirements or manufacturer's recommendations, provide heavier gage studs and/or decrease stud spacing as necessary to conform to code requirements.

C. Suspended and Furred Ceiling Systems and Wall Furring: Suspended ceiling framing system shall support finished ceiling, light fixtures, air diffusers, and accessories, as required. Suspension system shall provide a maximum deflection of L/240. Carrying channels shall be fabricated from minimum 0.0548 inch thick cold-rolled steel, 1 ½-inch wide by 7/16 inch deep. Carrying channels for supports under ducts shall be 2 inches in size as specified. Carrying channels shall be fabricated from hot-dip galvanized coated sheet.

1. Gypsum Wallboard Ceilings: Furring members shall be fabricated from cold-rolled steel, 7/8 inch by 2 9/16-inch. Furring members shall be fabricated from hot-dip galvanized coated sheet.
- D. Framed Ceilings: Framed ceiling framing system shall support finished ceiling, light fixtures, air diffusers, and accessories, as required. Suspension system shall provide a maximum deflection of L/240.
 1. Plaster and Gypsum Wallboard Ceilings: Ceiling joists shall conform to ASTM C645, hot-dip galvanized coated steel, C-shaped, unpunched, 20 gage (30 mil) minimum, unless noted otherwise.
 - E. Shaft Wall Framing Members: CH studs and J runners, 20 gage (30 mil) minimum for 2, 4 or 6 inch studs, conforming to ASTM C645, fabricated of steel conforming to ASTM A653, hot-dip galvanized.
 - F. Framing Accessories: Provide standard related accessories including floor and ceiling tracks, clips, web stiffeners, anchors, and similar items, of same manufacture as each type of stud specified, and as required for a complete installation.
 - G. Splay Wires and Compression Struts: Approved manufacturers acceptable to manufacturer of ceiling grids, gages and types as required by building codes for ceiling types and weights specified.
 - H. Wires: Soft-annealed galvanized steel wire, 8 gage for hanger wires and 16 gage for framing unless otherwise specified.
 - I. Fasteners: Wafer-head screws, self-drilling type for 20 gage (30 mil) metal and heavier. ASTM C954 self-drilling, self-tapping screws, Type S-12 pan head, ½ inch long.
 - J. Fire Rated Acoustical Foam Tape: Compressible, closed cell polyvinyl chloride foam with pressure sensitive adhesive, in rolls with protective release liner on non-adhesive face, 6 pounds per cubic foot density, 1 inch wide x not less than 1/4 inch thick, self-extinguishing, UL 94 recognized, Norseal V740FR, manufactured by Norton Performance Plastics Corporation, or equal.
 - K. Acoustical Sealant: Permanently resilient type, non-hardening, as specified in Section 07 9200.
 - L. Zinc-Rich Paint: Conform to Fed Spec DOD-P-21035A, Z.R.C. "Cold Galvanizing Compound", manufactured by ZRC Products Company, or equal. Provide for touch-up of galvanized surfaces.
 - M. Steel Backing Plates: Provide a minimum 4 inch wide by 16 gage (54 mil) steel, or sections of studs and stud track welded or fastened to web of studs, except as otherwise indicated. Apply shop coat of metal primer.
 - N. Anchorage Devices Powder Actuated: Minimum 0.177 inch diameter by 1-7/16 inch long fasteners in regular concrete and 0.145 inch diameter by 1 1/8-inch long fasteners

in lightweight concrete. Allowable shear and tension values as permitted in ICC ES reports shall be reduced to 80 percent.

- O. Anchorage Devices, Drilled Expansion Anchors: Minimum 3/8 inch diameter with 2-1/4 inch embedment. Allowable shear and tension values as permitted in ICC ES reports shall be reduced to 80 percent.
- P. Top Track System Materials:
 - 1. Forming steel shall be mill certified prime steel:
 - a. For 0.064 inch sections, conform to ASTM A1011, Grade 50 with a minimum yield point of 50,000 psi.
 - b. For 0.048 and 0.036 inch sections, conform to ASTM A1008, Grade C, with a minimum yield point of 33,000 psi.
 - c. Formed steel shall be provided with galvanizing in accordance with ASTM A653 for a Class G90 zinc coating.
 - 2. Fasteners:
 - a. For attachment of steel studs to slotted track or deflection clip, minimum No.8 corrosion resistant by 1/2 inch waferhead screws.
 - b. For attachment of track system to overhead structural element or metal decking, as provided for by the structural details affecting the Work.
 - 3. Sprayed-on Fireproofing
 - a. Sprayed-on fireproofing shall be as specified in Section 07 8116 - Cementitious Fire Proofing.
 - 4. Dry Method.
 - a. Dry mineral wool and sealant system shall use only such products as are represented to have been fully tested and approved under UL 2079 and as specified in Section 07 8413 - Penetration Firestopping.
 - b. Mineral wool shall be compressed to the degree as used on approval fire and hose stream test.
 - c. The system supplier shall provide a measuring device capable of determining compression to determine compliance with required density.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that overhead or concealed Work is completed, tested, inspected, and finished as required before starting Work of this section.

3.02 INSTALLATION

A. Walls and Partitions:

1. Fasten floor runners for exterior walls and interior partitions to concrete slab with required power driven fasteners. Spacing of fasteners not to exceed 24 inches on center. Fasten ceiling runners to structure as by top track system manufacturer.
2. Sound insulated walls and partitions: Embed floor runner tracks in two beads of acoustical sealant or two runs of compressible tape seal. Install top track nested into slotted track system, in same manner for full height of walls. Where wall ends abutting concrete, masonry, or steel set end studs in two beads of acoustical sealant or two tape seals and secure at 4-foot centers vertically.
3. Space studs not over 16 inch on center unless indicated otherwise. Studs shall be located approximately 2 inches from door frame jambs, abutting partitions and partition corners, except those providing support for door and window openings.
4. Furnish and install manufacturer's standard floor track. Fasten track to floor by means of 1/4 inch by 1 1/4-inch Star "Dryvin" hammer drive anchors or 3/16 inch by 1 inch round head, "Rawl-Drives" one-piece expansion bolts spaced not to exceed 3 feet, and installed in drilled holes in slab, or to wood joist with nails as indicated. Track may be fastened to concrete floor slabs with, power-driven fasteners.
5. Studs shall be seated squarely in track with stud web and flanges abutting track web, plumbed and securely fastened with sheet metal screws, to flanges or web of both floor and top tracks. Provide 4 screws per stud.
6. Where there is no suspended ceiling, tops of stud walls shall be provided with track and shoes and be fastened as specified for floors. Welding of studs to ceiling track will not be permitted except where bearing studs are installed.
7. Over metal door frames, install a cut-to-length section of runner track, with flanges slit and web-bent to allow flanges to overlap adjacent vertical studs, and securely fasten to studs. At doorjamb, extend studs continuous to structure above.
8. Bridging, or horizontal bracing of 1 1/2-inch, cold-rolled channels shall be fastened in a manner to prevent stud rotation. Bridging shall be furnished as

follows: walls up to 10 feet high, one row at mid-height; walls exceeding 10 feet high, bridging or bracing rows spaced not to exceed 5 feet on center.

9. Wind bracing shall be fastened where indicated on Drawings. Minimum size of strap shall be as indicated on Drawings. Track where strap terminates shall be anchored as indicated on Drawings.
- B. Gypsum Wallboard Ceiling Suspension and Framing: Suspended ceiling system framing shall be installed in accordance with ASTM C754, and as follows.
1. Hangers shall be spaced not more than 48 inches along runner channels and 36 inches in other direction or 42 inches in both directions unless otherwise indicated. Locations of hanger wires shall be coordinated with other Work. Hangers at ends of runner channels shall be located not more than 6 inches from walls. Hanger wire shall be fastened to structural elements with required fasteners. Sags or twists, which develop in suspended system, shall be adjusted. Damaged or faulty parts shall be replaced.
 2. Main Runners: Hanger wires shall be double strand saddle-tied to runner channels and ends of hanger wire shall be twisted three times around itself. Main runners shall be located to within 6 inches of parallel wall to support ends of cross furring. Main runners shall not come in contact with abutting masonry or concrete walls. Where main runners are spliced, ends shall be overlapped 12 inches with flanges of channels interlocked, and shall be securely tied at each end of splice with wire looped twice around channels.
 3. Furring channels shall be fastened to runner channels and to structural supports at each crossing with tie wire, hairpin clips, or required fastenings. Furring channels shall be located within 2 inches of parallel walls and beams, and shall be cut 1/2 inch short of abutting walls.
 4. Ceiling Openings: Support members shall be provided as required at ceiling openings for access panels, recessed light fixtures, and air supply or exhaust. Support members shall be not less than 1 1/2-inch main runner channels and vertically installed suspension wires or straps shall be located to provide at least minimum support specified for furring and wallboard attachment. Intermediate structural members not a part of structural system, shall be provided for attachment or suspension of support members.
 5. Light fixtures and air diffusers shall be supported directly from suspended ceiling runners. Wires shall be provided at required locations to support weight of recessed or surface mounted light fixtures and air diffusers.
 6. Control Joints: Ceiling control joints for expansion and contraction shall be located where indicated on drawings. A control joint or intermediate blocking shall be installed where ceiling framing members change direction.
 - a. Interior Ceilings with Perimeter Relief: Control joints shall be installed so linear dimensions between control joints shall not exceed 50 feet in either direction or more than 2,500 square feet in area.

- b. Interior Ceilings without Perimeter Relief: Control joints shall be installed so linear dimensions between control joints shall not exceed 30 feet in either direction nor more than 900 square feet in area.
- C. Splay Wires and Compression Struts: Install as detailed and as required to prevent upward and sideward motion under seismic conditions, as required by code.
- D. Suspension Under Ducts: For hangers spaced at 4 to 5 ½-foot centers, provide 6 gage (0.192 inch diameter) hanger wires with minimum 2 inch runner channels spaced at maximum 48 inch centers. For greater spans, design system for live load of 10 pounds per square foot of area plus dead load and provide a detail in Shop Drawings.
- E. Furring: Provide framing for horizontal furring as shown or required. Conform to above requirements as applicable.

3.03 CONNECTIONS TO METAL DECKING

- A. Provide pre-molded neoprene filler strips matching flute profile for non-fire-rated walls and partitions covered on one or both sides up to metal decking.
- B. The top runner track of fire-rated partitions shall be a minimum of 20 gage (33 mils) and fastened to metal deck with required fasteners at spacing required for fire rating, but in no case over 16 inches on center. Neither wallboard nor metal studs shall be fastened to top runner to allow for slab deflection. Areas above runner shall be friction fit with a minimum depth of 2 1/2-inch of 4 pounds per cubic foot mineral wool insulation. A minimum of 1/2 inch of firestopping compound shall be installed to each side of mineral wool insulation for 1-hour system, and 1 inch of firestopping for a 2-hour system. Install required special tracks, angles, fasteners and strips of gypsum wallboard as required to achieve required fire resistance rating.
- C. Proprietary fire-rated top tracks are installed in accordance with manufacturer's recommendations and fire rating approval requirements.

3.04 CLEANING

- A. Remove debris, rubbish, and waste material and legally dispose of off Project site.

3.03 PROTECTION

- A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 2900

GYPSUM BOARD

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Gypsum board, sheathing and tile backer systems and accessory.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 05 4100 - Structural Metal Stud Framing.
3. Section 07 8413 – Penetration Firestopping.
4. Section 07 9200 - Joint Sealants.
5. Section 09 2216 - Non-Structural Metal Framing.

1.02 PROJECT REQUIREMENTS

- A. Design Requirements: Provide systems capable of resisting deflection as required by CBC and authorities having jurisdiction.
- B. Regulatory Requirements: Comply with CBC requirements for design and installation.

1.03 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating complete suspension system including connections, anchorage, and trim features.
- B. Material Samples: Submit 18 inch by 18 inch Samples of the texture coat of gypsum board panels with edges taped.
- C. Product Data: Submit manufacturer's catalog data for each product proposed for installation.

1.04 QUALITY ASSURANCE

A. Comply with following as a minimum requirement:

1. ASTM C474 - Standard Test Methods for Joint Treatment Materials for Gypsum Board Construction.

2. ASTM C475 – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
3. ASTM C514 – Standard Specification for Nails for the Application of Gypsum Board.
4. ASTM C840 – Standard Specification for Application and Finishing of Gypsum Board.
5. ASTM C919 – Standard Practice for Use of Sealants in Acoustical Applications.
6. ASTM C954 – Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 inch to 0.112 inch in Thickness.
7. ASTM C1002 – Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
8. ASTM C1047 – Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
9. ASTM C1177 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
10. ASTM C1178 – Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
11. ASTM 1325 – Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.
12. ASTM C1396 – Standard Specification for Gypsum Board.
13. ASTM C1629 - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
14. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
15. ASTM D3274 - Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation.
16. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
17. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
18. ASTM E695 - Standard Method for Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading.

19. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
 20. Underwriters Laboratories (ULI) requirements and listings for fire-rated materials and products classification.
 21. GA 214 - Gypsum wallboard finish shall conform to requirements of GA 214, Application and Finishing of Gypsum Panel Products, published by the Gypsum Association, and as specified herein.
 22. GA 600 - Gypsum wallboard shall conform to requirements of GA 600 Fire Resistance Design Manual, published by the Gypsum Association.
 23. American National Standards for the Installation of Ceramic Tile.
 24. ANSI A118.9 - Specification for Cementitious Backer Units.
- B. Qualifications: Installer shall have a minimum 5 years experience in installing and finishing gypsum board.
- C. CHPS Low-Emitting Materials table: Materials submitted must meet the CHPS Low-Emitting criteria and be listed as Low-Emitting on the following web site: www.CHPS.net.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original, factory sealed packages, containers or bundles bearing brand name and name of manufacturer.
- B. Materials shall be kept dry. Gypsum wallboard shall be neatly stacked flat; avoid sagging and damage to edges, ends, and surfaces.
- C. Fire-rated materials shall have fire classifications numbers attached and legible.
- D. Provide all means necessary to protect gypsum board systems before, during, and after installation.
- E. Gypsum wallboard showing any evidence of water damage shall not be installed. Gypsum wallboard showing evidence of water damage after installation shall be removed and replaced.

1.06 TESTING AND INSPECTION

- A. Testing and inspection shall comply with CBC 110.3.4, 110.3.5 and 110.3.6.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Georgia-Pacific, National Gypsum Co., U.S. Gypsum Co., James Hardie, or equal.

2.02 MATERIALS

- A. Gypsum Board Type X (fire-resistant): 5/8 inch thick, 4-foot wide and up to 16-foot long conforming to ASTM C1396 with long edges tapered.

GYPSUM BOARD SYSTEM			
Panel	Fasteners	Joint Tape	Joint Treatment
United States Gyp. Co.: 5/8 inch Sheetrock regular, type X, Firecode Core, or Firecode C Core Gypsum panels, as required by UL design.	Wood: 1 1/4-inch Type W drywall screws. Steel: 1 1/4-inch Type S or S-12 drywall screw.	Sheetrock paper tape Heavy Duty to meet ASTM C 475.	Sheetrock Setting Type, Lightweight Setting, Sheetrock Taping, Topping, or All-Purpose, Sheetrock Ready-Mixed Taping, Topping, or All-Purpose, or Sheetrock Lightweight All-Purpose or Ready-Mixed - Plus 3
Georgia-Pacific: 5/8 inch ToughRock regular, Fireguard or Fireguard C gypsum, as required by UL design.	Wood: 1 1/4-inch Type W drywall screws. Steel: 1 1/4-inch Type S or S-12 drywall screw.	Sheetrock paper tape Heavy Duty to meet ASTM C475.	Same as above
National Gypsum Co. 5/8 inch Gold Bond regular, Fire-Shield or Fire-Shield C gypsum wallboard, as required by UL design.	Wood: 1 1/4-inch Type W drywall screws. Steel: 1 1/4-inch Type S or S-12 drywall screw.	ProForm Joint Tape, ProForm Multi-Flex Tape Bead, ProForm Fiberglass Mesh Tape to meet ASTM C 475.	ProForm Multi-Use, ProForm All Purpose, ProForm Lite, ProForm Ultra, ProForm Taping, ProForm Triple-T, ProForm Topping, or ProForm Sta-Smooth, Sta-Smooth Lite, Sta-Smooth HS Joint Compound.

- B. Impact Resistant Gypsum Board, Type X (fire-resistant): 5/8 inch thick, 4-foot wide and up to 16-foot long complying with one of the following:
 1. Fire resistant rated gypsum core with additives to enhance impact resistance, faced with moisture and mold resistant paper, and complying with ASTM C1396.
 2. Fire resistant, high density paperless gypsum with reinforcing fiber mesh.
 3. Fire resistant fiberglass-mat faced gypsum board panels

GYPSUM BOARD IMPACT RESISTANT SYSTEMS			
Panel	Fasteners	Joint. Tape	Joint Treatment
United States Gyp. Co.: 5/8 inch Fiberock VHI Gypsum fiber panels.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S-12 drywall screw.	Sheetrock paper tape Heavy Duty.	Sheetrock Setting compound.
Georgia-Pacific: 5/8 inch DensArmor Plus Impact Resistant Panels	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S-12 drywall screw.	Glass mesh.	Same as above.
National Gypsum Co.: 5/8 inch Hi-Impact XP gypsum wallboard.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S-12 drywall screw.	ProForm joint tape	Proform XP all-purpose joint compound.

- C. Mold and Water Resistant Gypsum Board, Type X (fire-resistant): (Use mold resistant Liner Panel at elevator shaft interior), 5/8 inch thick 4-foot wide, up to 16-foot long conforming to ASTM C1396 with long edges tapered.
1. Resistance to Mold Growth: Minimum score of “10” when tested in accordance to ASTM D3273 and evaluated in accordance with ASTM D3274.
 2. Resistance to Fungi: Maximum score of “0” when tested in accordance to ASTM G21.

GYPSUM BOARD MOLD RESISTANT SYSTEM			
Panel	Fasteners	Joint Tape	Joint Treatment
United States Gyp. Co.: 5/8 inch Sheetrock Mold Tough, Firecode Core, or Firecode C Core Gypsum panels.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S or S- 12 drywall screw.	Glass Mesh.	Setting-type joint compound rated 10 when tested in accordance with ASTM D3273 and evaluated in accordance with ASTM D3274.
Georgia-Pacific: 5/8 inch Dens Armor Plus Fireguard or Fireguard C Interior Panels (Fire-Rated).	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼-inch Type S or S- 12 drywall screw.	Same as above.	Same as above.
National Gypsum Co.: 5/8 inch Gold Bond XP regular, Fire-Shield or Fire- Shield C gypsum wallboard.	Wood: 1 ¼-inch Type W drywall screws. Steel: 1 ¼- inch Type S or S-12 drywall screw.	Same as above.	Same as above.

- D. Gypsum Liner, Type X (fire-resistant): 1 inch thick 24-inch wide, up to 14-foot long, conforming to ASTM C1396 or C1658.
1. Resistance to Mold Growth: Minimum score of “10” when tested in accordance to ASTM D3273 and evaluated in accordance with ASTM D3274.
 2. Resistance to Fungi: Maximum score of “0” when tested in accordance to ASTM G21.

GYPSUM BOARD SHAFTWALL SYSTEMS			
Panel	Fasteners	Joint. Tape	Joint Treatment
United States Gyp. Co.: 5/8 inch Mold Tough Type X Firecode Core, Gypsum panels, 3/4 inch Mold Tough Ultracode Core and 1 inch Mold Tough Liner panels.	1 1/4-inch, 1 5/8-inch, or 2 1/4-inch Type S or S-12 drywall screw.	Glass Mesh.	Setting-type joint compound rated 10 when tested in accordance with ASTM D3273 and evaluated in accordance with ASTM D3274.
Georgia-Pacific: 5/8 inch ToughRock Fireguard, or ToughRock Fireguard, C gypsum board or DensArmor Plus Fireguard or Fireguard C Interior Panels (Fire-Rated) and 1 inch DensGlass Ultra Shaftliners panels.	1 1/4-inch, 1 5/8-inch, or 2 1/4-inch Type S or S-12 drywall screw.	Same as above.	Same as above.
National Gypsum Co.: 5/8 inch Gold Bond regular, Fire-Shield or Fire-Shield C gypsum wallboard and 1 inch Gold Bond Fire-Shield Shaftliner.	1 1/4-inch, 1 5/8-inch, or 2 1/4-inch Type S or S-12 drywall screw.	ProForm XP all-purpose joint compound.	Same as above.

E. Tile Backer Board, Type X (fire-resistant):

1. Water resistant panels, 5/8 inch thick, 4-foot wide and up to 8-foot long conforming to one of the following requirements:
 - a. Aggregated Portland cement board with polymer-coated, woven glass-fiber mesh embedded in front and back surfaces.
 - b. Fiberglass-mat faced gypsum backing board complying with ASTM C1178.
 - c. Cementitious board surfaced with fiberglass reinforcing mesh on front and back and complying with ANSI A118.9 and ASTM C1325.
2. Tile backer boards shall meet the following requirements:
 - a. Resistance to Mold Growth: Minimum score of “10” when tested in accordance to ASTM D3273 and evaluated in accordance with ASTM D3274.
 - b. Resistance to Fungi: Maximum score of “0” when tested in accordance to ASTM G21.

TILE BACKER BOARD SYSTEMS			
Panel	Fasteners	Joint. Tape	Joint Treatment

United States Gyp. Co.: 5/8 inch DUROCK Cement Board.	Wood: 1 ½-inch galvanized roofing nails or 1 1/4-inch 1 5/8 inch, or 2 ¼-inch DUROCK No. 8 wood screws. Steel: 1 1/4-inch or 1 5/8 inch DUROCK No. 8 screws.	DUROCK fiberglass tape.	ANSI A136.1 Type I: Organic adhesive or ANSI A118.1 acrylic latex modified dry-set mortar or ANSI A118.4 Latex Portland cement mortar.
Georgia-Pacific: 5/8 inch DensShield Fireguard Tile Backer.	Wood: 1 ¾-inch galvanized roofing nails or 1 5/8 inch Buglehead corrosion resistant, course thread, drywall screws. Steel: 1 1/4-inch Buglehead, corrosion resistant, fine thread, drywall screws.	2-inch wide fiberglass mesh tape.	ANSI A136.1 Type I: Organic adhesive or ANSI A118.1 acrylic latex modified dry-set mortar or ANSI A118.4 Latex Portland cement mortar.
National Gypsum Co.: 5/8 inch PermaBase Brand Cement Board.	Wood: 1 ½-inch galvanized roofing nails or 1 1/4-inch or 1 5/8 inch, PermaBase corrosion resistant screws. Steel: 1 1/4-inch or 1 5/8 inch Type S-12 screws.	PermaBase mesh tape. 2-inch wide polymer-coated (alkali resistant) mesh tape for interior applications. 4-inch wide polymer coated (alkali resistant) mesh tape for exterior applications.	Treat joints and set facing material with latex-Portland cement mortar or dry-set (thin-set) mortar. Mortars shall comply with ANSI A118.1 or A118.4 standards. Type I organic adhesive meeting ANSI A-136.1 for interior use only.
James Hardie Building Products Inc.: ½ inch or ¼ inch Hardibacker 500 Cement Board (for floor and countertop application at existing schools only).	Wood: 1 ½-inch galvanized roofing nails. Wood and Steel: 1 1/4-inch No. 8 by 0.375 HD self drilling, corrosion resistant ribbed wafer head screws.	2-inch Wide High Strength. Coated, alkali-resistant, glass fiber reinforcing tape.	ANSI A136.1 Type I: Organic adhesive or ANSI A118.1 acrylic latex modified dry-set mortar or ANSI A118.4 Latex Portland cement mortar.

- F. Sheathing, Type X (fire-resistant): 5/8 inch thick, 4-foot wide and up to 10-foot long fiberglass-mat faced gypsum backing board complying with ASTM C1177 or ASTM C1178.
1. Resistance to Mold Growth: Minimum score of “10” when tested in accordance to ASTM D3273 and evaluated in accordance with ASTM D3274.
 2. Resistance to Fungi: Maximum score of “0” when tested in accordance to ASTM G21.

GYPSUM BOARD SHEATHING SYSTEMS			
Panel	Fasteners	Joint. Tape	Joint Treatment
United States Gyp. Co.: 5/8 inch Securock Glass-Mat Sheathing.	Wood: 1 ¼-inch # 6 buglehead corrosion-resistant fasteners. Steel: 1 ¼-inch Type S-12 drywall screw.		
Georgia-Pacific: 5/8 inch Densglass Gold Type "X"	Wood: 1 ¼-inch # 6 buglehead corrosion-resistant fasteners. Steel: 1 ¼-inch Type S-12 drywall screw.		

National Gypsum Co.: Gold Bond Brand e2XP Fire-Shield Extended Exposure Gypsum Sheathing.	Wood: 1 ¼-inch # 6 buglehead corrosion- resistant fasteners. Steel: 1 ¼-inch Type S-12 drywall screw.		
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2.03 ACCESSORIES

- A. Metal Trim: Paper-faced metal drywall beads and trim meeting ASTM C1047, as manufactured by USG/Beadex, National Gypsum, or equal. Trim units shall be of size and type to fit gypsum board construction and shall include corner beads, casings, edge trim and other shapes indicated and required.
- B. Mold Resistant Joint Compound: As recommended by board manufacturer, OnePass by CTS Cement Manufacturing Co., or equal, meeting the following requirements:
 - 1. Minimum score of “10” when tested in accordance with ASTM D3273 and evaluated in accordance with ASTM D3274.
 - 2. Shall conform to ASTM C475.
- C. Joint Tapes: Shall conform to ASTM C475.
- D. Finishing Materials:
 - 1. High solids primer shall be SHEETROCK Brand First Coat manufactured by USG or High-build primer by Sherwin Williams, or equal.
 - 2. Texture coat finish material shall be manufactured by U.S. Gypsum, Hamilton, or Highland Stucco and Lime Products, Inc., or equal.
- E. Acoustical Sealant: Non-hardening, non-shrinking, for use in conjunction with gypsum board, as recommended by Board Manufacturer and conforming to ASTM C919.
- F. Fasteners:
 - 1. Self-drilling, self-tapping bugle-head drywall screws; in conformance to ASTM C1002. No. 6 Type S or S12, 1 ¼--inch long for metal framing,
 - 2. Wood framing:
 - a. Nails: Hot dip, 0.016 inch diameter galvanized nails with 7/16 inch head and 1 ¼-inch minimum length.
 - b. Screws: Type W 1 ¼-inch minimum length for single-layer panels. Screws shall be furnished with a corrosion-resistant treatment.
 - 3. Adhesive: as recommended by board manufacturer and in compliance to ASTM C557.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Metal Trim:

1. Provide corner beads at outside corners and angles, metal casing where gypsum board terminates at uncased openings, metal edge trim where board edges abut horizontal and vertical surfaces of other construction.
2. Install trim in accordance with manufacturer's directions with appropriate joint compound. Install trim in longest practical pieces.

B. Gypsum Board:

1. Install gypsum board in conformance with ASTM C840.
2. Gypsum board shall be cut by scoring and breaking or by sawing, working from face side. Where board meets projecting surfaces it shall be scribed and neatly cut. Unless conditions require otherwise, gypsum board shall be installed first to ceilings, then to walls. End joints shall occur over a support. Install panels of maximum practical length so a minimum number of end joints occur.
3. End joints shall be staggered and joints on opposite sides of a partition shall be arranged to occur on different studs. Joint layout at openings shall be installed so no end joints will align with edges of openings.
4. Except where specified otherwise, fasteners shall be spaced not less than 3/8 inch from edges and ends of gypsum board. Do not stagger fasteners at adjoining edges and ends.
5. Install gypsum board vertically or horizontal as permitted by specific UL Design at walls. Fasten board with drywall screws spaced not to exceed 8 inches on centers around perimeter of boards and 8 inches on centers on intermediate studs. Space screws at 8 inches on centers along top and bottom runners. Screws shall be driven to provide screwhead penetration just below gypsum board surface without breaking surface paper. Where electrical outlet and switch boxes are indicated, provide adjustable attachment brackets between studs.
6. Install gypsum board to ceiling framing with long dimension at right angles to furring channels, or wood framing members, and fasten with specified drywall screws or nails spaced 6 inches to 7 inches on centers across board. Screws or nails shall be not less than 1/2 inch from side joints and 3/8 inch from butt end joints. Abutting end joints shall occur over furring channels and end joints of boards shall be staggered. Support cutouts or openings in ceilings with furring channels.
7. Install access doors, furnished under another section, in correct location, plumb, or level, flush with adjacent construction, and securely fastened to framing.

3.02 TOLERANCES

- A. Install gypsum board flat within 1/8 inch in 10 feet.

3.03 JOINT TREATMENT AND FINISHING

Level	Joints	Interior Angles	Accessories	Fasteners	Surface
1	Tape set in compound	Tape set in joint compound			Tool marks and ridges acceptable
2	Tape set in joint compound and one separate coat of joint compound	Tape embedded in joint compound and wiped to leave a thin coat of compound over tape, and one separate coat	Covered by one separate coat of joint compound	Covered by one separate coat of joint compound	Free from excess joint compound. Tool marks and ridges acceptable.
3	After taping, cover with two separate coats of joint compound	After taping, cover with one separate coat of joint compound	Covered by 3 separate coats of joint compound	Covered by 2 separate coats of joint compound	Smooth and free of tool marks and ridges *
4	After taping, cover with 2 separate coats of joint compound	After taping, cover with one separate coat of joint compound	Covered by 3 separate coats of joint compound	Covered by 3 separate coats of joint compound	Smooth and free of tool marks and ridges *
5	After taping, cover with 2 separate coats of joint compound	After taping, cover with one separate coat of joint compound	Covered by 3 separate coats of joint compound	Covered by 3 separate coats of joint compound	Skim coat of joint compound applied to entire surface. Surface free from tool marks and ridges. *

*At completion of specified taping and finishing, install one coat of high solids primer as specified hereafter

- B. Levels: Install tape bedding compound, tape, and finishing cement on joints in wallboard as required for specified levels of finish.
- C. Levels 2 through 5:
 1. Install joint cement and finishing cement over screw heads. Treat all inside corners with joint cement, tape, and finishing cement. Treat outside corners with corner beads and finishing cement.
 2. Provide metal casing beads at all edges of gypsum wallboard, which abut ceiling, wall, or column finish, and elsewhere as required, such as openings, offsets, etc. Install all exposed joints, trims, and attachments non-apparent following installation of paint or other finishes. If joints and fasteners are visibly apparent, correct defects as required.
 3. Seal raw edges of plumbing openings and boards that have been cut to fit with sealing compound brushed on.
 4. When entire installation is completed, correct and repair broken, dented, scratched or damaged wallboard before installation of finish materials by other trades.

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- D. Levels 3 and 4: Install one coat of high solids primer over entire surface.
- E. Level 5: Install one coat of skim coat over entire surface, followed by one coat of high solids primer over entire surface.

3.04 REQUIRED LEVELS OF FINISH

- A. Unless otherwise indicated or specified, levels of finish required shall be as follows:
 - 1. Level 1: Plenum areas above ceilings, insides of shafts, and other concealed areas. Taping to be as required for fire rated assemblies.
 - 2. Level 2: Water-resistant wallboard backing for high moisture areas to be covered with a water resistant surface other than tile, vinyl or paint, i.e stainless steel cladding etc.
 - 3. Level 3: Backing for vinyl wall covering and adhered acoustic tile. Also, provide where textured finish is indicated.
 - 4. Level 4: Exposed painted wallboard in utility rooms, and similar spaces not requiring Level 5 finish.
 - 5. Level 5: Exposed, painted wallboard in offices and corridors.

3.05 TEXTURE COAT

- A. Spray install texture coat to interior gypsum board surfaces where indicated on Drawings.
- B. Texture coat shall provide a uniform splatter pattern finish with an 80 percent minimum coverage of surface.
- C. Provide protection from spray for interior surfaces of electrical boxes and wiring.

3.06 CLEAN-UP

- A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.07 PROTECTION

- A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 5113

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Lay-in acoustical ceiling systems and metal suspension system.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 09 2216 - Non-Structural Metal Framing.
 - 3. Section 09 2900 - Gypsum Board.
 - 5. Section 11 5215 – Video/Multimedia Projector Mounting Plate.
 - 6. Division 23 - HVAC.
 - 7. Division 26 - Electrical.

1.02 QUALITY ASSURANCE

- A. Ceiling systems shall consist of lay-in acoustical ceiling panels by a single manufacturer and suspension systems by a single manufacturer for the entire project.
- B. Qualifications of Installer: Minimum five years experience in installing acoustical ceiling systems of the types specified.
- C. Design Criteria:
 - 1. Deflection of finished surface to 1/360 of span or less.
 - 2. 1/8 inch maximum permissible variation from true plane measured from 10 foot straightedge placed on surface of finished acoustical fiber units.
- D. Requirements of Regulatory Agencies:
 - 1. Conform to CBC requirements and UL - Tunnel Test for Fire Hazard Classification of Building Materials.
 - 2. Cisca: Acoustical Ceilings Use and Practice.
 - 3. Division of the State Architect: Comply with requirements of IR 25-2.13.
- E. American Society for Testing and Materials (ASTM):
 - 1. ASTM A641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - 2. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

3. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
4. ASTM C635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
5. ASTM C636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
7. ASTM E580 – Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
8. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.
9. ASTM E1414 - Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
10. ASTM E1477 - Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.

F. American Society of Civil Engineers (ASCE):

1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures, as amended by CBC 1615A.1.16.

G. CHPS Low-Emitting Materials Table: Materials submitted must be listed as low emitting on the CHPS website, www.CHPS.net,

1.03

SUBMITTALS

A. Samples:

1. Lay-in panels of each specified type, 6-inch by 6-inch minimum size.
2. Suspension System: 12-inch long samples of suspension system members, connections, moldings and wall angles, for each color specified.

B. Shop Drawings:

1. Indicate complete plan layouts and installation details.
2. Indicate related Work of other sections which is installed in, attached to, or penetrates ceiling areas, such as air distribution and electrical devices.

C. Product Data:

1. Suspension System for Lay-in Ceiling: Printed data for suspension system components, including load tests, indicating conformance to specified tests and standards.
2. Acoustical units: Printed data indicating conformance to specified tests and standards.

- D. Maintenance Materials: Provide extra panels equal to 1 percent of the area of each typical module size of acoustical panel, but not less than 8 of each specified size, style and color.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the Project site in original sealed packages.
- B. Storage: Store materials in building area where they will be installed, in original package. Keep clean and free from damage due to water or deteriorating elements.
- C. Handle in a manner to prevent damage during storage and installation.

1.05 PROJECT CONDITIONS

- A. Installation of acoustical ceiling system shall not begin until the building is enclosed, permanent heating and cooling is in operation, and residual moisture from plaster and concrete work has dissipated. Building areas to receive ceilings shall be free of construction dust and debris.
- B. Environmental Requirements: Maintain temperature in space at 55 degrees F or above for 24 hours before, during, and after installation of materials.
- C. Scheduling:
 1. Before concealing Work of other sections, verify required tests and inspections have been completed.
 2. Coordinate with related Work of other sections. Coordinate location and symmetrical placement of air distribution devices, electrical devices, and penetrations with related Work section.

1.06 WARRANTY

- A. Manufacturer shall provide a 10 year material warranty.
- B. Installer shall provide a two year fabrication and installation warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. USG Corporation.
- B. Armstrong World Industries.
- C. CertainTeed Ceilings Corp.
- E. Equal.

2.02 SUSPENSION SYSTEM

- A. Metal suspension system for acoustical lay-in tile shall be hot-dipped galvanized steel conforming to ASTM A653. Main beams and cross tees shall be double-web steel construction with exposed flange design, with factory punched cross tee slots, hanger holes and integral couplings.

- B. Metal suspension system for acoustical lay-in tile shall conform with ASTM C635, C636 and E580 and section 13.5.6 of ASCE 7, as amended by CBC Section 1615A.1.16, for installation in high seismic areas.
- C. Structural classification of suspension systems shall be heavy-duty in conformance to ASTM C635.
- D. Vertical Strut: USG Donn Compression Post, or equal, or as indicated; types and designs complying with requirements of authorities having jurisdiction and seismic Zones D, E and F requirements. Provide base attachment clip for connection of vertical strut to main beams.
- E. Wall Molding: Fabricated from galvanized steel with 2-inch horizontal leg and hemmed edges, same finish as main and cross tees.
- F. Spacer/Stabilizer Bars: Provide for tying together the ends of main runners and cross tees that are not attached to wall molding.
- G. Hanger Wire: 0.106 inch diameter (0.144 inch diameter for pendant fixtures), galvanized soft annealed mild steel wire as defined in ASTM A641, Class 1 coating.
- H. Provide attachment devices and any other required accessories for a complete suspended ceiling system installation.

2.03 ACOUSTICAL CEILING PANELS

- A. Acoustical ceiling panels shall be class A in accordance to ASTM E1264.
- B. Acoustical panels shall meet the following surface-burning characteristics when tested in accordance to ASTM E84 for Class A materials:
 - 1. Maximum Flame Spread: 25.
 - 2. Maximum Smoke Developed: 50.
- C. Mold and Mildew Resistance: Panels and faces shall be treated with a biocide paint additive or an antimicrobial solution to inhibit mold and mildew.

2.04 CEILING TYPES

- A. AC 1 – General:
 - 1. Acoustical Ceiling Panels:
 - a. Panel Name: Armstrong Ultima High NRC 9/16” Beveled Tegular or equal.
 - b. Panel Size: 2-foot by 2-foot.
 - c. Panel Thickness: 7/8 inch.
 - d. Edge Detail: Beveled Tegular.
 - e. Light Reflectance: 0.87 minimum, complying with ASTM E1477.
 - f. CAC: Minimum 35, UL Classified, complying with ASTM E1414.
 - g. NRC: Minimum 0.80, UL Classified, complying with ASTM C423.
 - h. Color: White.

- i. Recycled Content: Up to 87 percent.
- 2. Suspension System:
 - a. Suspension System Name: Suprafine Series, 9/16 inch grid by Armstrong, or equal.
 - b. Color: White.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Furnish layouts for inserts, clips or other supports and struts required to be installed by the Work of other trades that depend on the suspended ceiling system for support.
- B. Coordinate related Work to ensure completion prior to installation of clips or fasteners.
- C. Compare layouts with construction conditions. Tile shall be spaced symmetrically about the centerlines of the room or space, and shall start with a tile or joint line as required to avoid narrow tiles at the finish edges unless indicated otherwise. Joints shall be tight with joint lines straight and aligned with the walls. Ceiling moldings shall be provided where tile abuts wall with matching caulking to eliminate any space.

3.02 INSTALLATION OF SUSPENSION SYSTEMS

- A. General:
 - 1. Install suspension system in accordance with ASTM C636 and ASTM E580.
 - 2. System shall be complete; with joints neatly and tightly joined and securely fastened; suspension members shall be installed in a true, flat, level plane.
 - 3. Hanger Wires: 0.106 inch diameter minimum; larger sizes as indicated or required.
 - a. Fasten wires to panel points and structure above per most stringent requirements of fabricator and CBC and as indicated on Drawings.
 - b. Wires exceeding 1:6 out-of-plumb shall be braced with counter-sloping wires.
 - c. Maintain wires at least 6 inches from non-braced ducts, pipes, conduits, and other items.
 - d. Install wire along main runners at 4 feet on center. Terminal ends of each main runner and cross tee must be supported within 8 inches of each wall with a perimeter wire or within one-fourth (1/4) of the length of the end tee, whichever is least, for the perimeter of the ceiling area.
 - e. Where obstructions prevent direct suspension, provide trapezes or equivalent devices; 1 ½-inch minimum cold rolled channels back to back may be installed for spans to 6 feet maximum.

- f. Wire shall be straight, without extraneous kinks or bend. Hanger wire connections must be capable of carrying a 200 - pound pull without stretching or shifting the suspension clip.
4. Bracing Wires to Resist Seismic Forces: 0.106 inch diameter minimum, larger sizes as indicated or required.
 - a. System for Bracing Ceilings: Lay-In Ceiling Systems: Install one four-wire set of sway-bracing wires and a vertical strut for each 144 square feet maximum of ceiling area. Locate wire-sets and struts at 12 feet maximum on center. At ceiling perimeters, wire-sets shall be installed within 6 feet of walls.
 - b. Install four-wire sets and struts within 2 inches of cross-runner intersection with main runner; space wires 90 degrees from each other.
 - c. Do not install sway bracing wires at an angle greater than 45 degrees with the ceiling plane.
 - d. Wires shall be tight, without causing ceiling to lift.
 - e. Fasten struts in accordance with CBC requirements.
 - f. Maintain wires at least 6 inches from non-braced ducts, pipes, conduit, and other items.
5. Provide additional wires, 0.106 inch diameter minimum, necessary to properly support suspension at electrical devices, air distribution devices, vertical soffits, and other concentrated loads.
6. Suspension:
 - a. Suspension members shall be fastened to two adjacent walls per ASTM 580; but shall be at least 3/4 inches minimum clear of other walls.
 - b. Any suspension members not fastened to walls shall be interconnected to prevent spreading, near their free end, with a horizontal metal strut or stabilizer bar or 0.064 inch diameter taut tie wire.
 - c. Provide additional tees or sub-tees to frame openings for lights, air distribution devices, electrical devices, and other items penetrating through ceiling, which do not have an integral flange to support and conceal cut edges of acoustic panels. Provide cross bracing necessary to securely support any surface mounted fixtures or other items.
7. Attachment of Wires:
 - a. To Metal Deck or Steel Framing Members: Install as required by current code.
 - b. To Suspension Members: Insert through holes in members or supporting clips.

- c. Wires shall be fastened with three tight turns minimum for hanger wires and four tight turns minimum bracing wires. Turns shall be made in a 1 ½-inch maximum distance.

B. Suspension System for 2-foot by 4-foot Lay-in Acoustical Ceilings:

1. Main Runners: Install main runners 48 inches apart; 0.106 inch diameter hanger wires space 48 inches on center maximum along runners, and within 8 inches of ends.
2. Install wall moldings with fasteners to studs. Install corner caps at molding intersections.
3. Cross-Tees: Install between main runners in a repetitive pattern of 2-foot spacings.
4. Sub-Tees: Install at edges of penetrations.

3.03 INSTALLATION OF ACOUSTICAL PANELS

- A. Install panels into suspension system. Partial panels shall be neatly cut and fitted to suspension and around penetrations and/or obstructions. Duplicate tegular edges at partial panels; cuts to be straight. Repaint cut tiles to match color or as directed by manufacturer for mylar facing at visually exposed conditions or as required by the Architect.
- B. Penetrations through the ceilings for sprinkler heads and other similar devices that are not integrally tied to the ceiling system in the lateral direction shall have a 2 inch oversized ring, sleeve or adapter through the ceiling tile to allow free movement of one inch in horizontal directions. Alternatively per ASTM E580, a flexible sprinkler hose fitting that can accommodate one inch of ceiling movement shall be permitted to be used in lieu of the oversized ring, sleeve or adapter.

3.04 AIR DISTRIBUTION DEVICES

- A. Refer to and coordinate with Division 23 - HVAC.
- B. Install air distribution grilles and other devices into suspension system. Install 4 taut wires, each 0.106 inch diameter minimum, to each device within 3 inches of device corners, to support their weight independent of the suspension system.

3.05 LIGHT FIXTURES

- A. Refer to and coordinate with Division 26 - Electrical.
- B. Fixtures weighing less than 56 pounds: Install fixtures into suspension systems and fasten earthquake clips to suspension members. Install minimum 2 slack safety wires, each 0.106 inch diameter minimum, to each fixture at diagonally opposite corners, to support their weight independent of the system.
- C. Fixtures weighing 56 Pounds or more: Install fixtures into suspension system and fasten earthquake clips to suspension system members as required by the Drawings and/or code. Install not less than 4 taut 0.106 inch diameter wires capable of supporting four times the fixture load.

- D. Support pendant-mounted light fixtures directly from the structure above with hanger wires or cables passing through each pendant hanger and capable of supporting two times the weight of the fixture. Brace the pendant-mounted light fixtures by either a bracing assembly at the ceiling penetration or below the ceiling to the walls, as indicated in the drawings.

3.06 CLEANING

- A. General: After installation of acoustical material has been completed, clean surfaces of the material, removing any dirt or discolorations. Replace panels as required.
- B. Acoustical Panels: Minor abraded spots and cut edges shall be touched up with the same paint as was used for factory applied finish of the lay-in panels.
- C. Remove and replace work that can not be successfully cleaned and repaired to eliminate evidence of damage.

3.07 CLEAN UP

- A. Remove rubbish, debris, and waste materials and legally dispose off of the Project site.

3.08 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 6513

RUBBER BASE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Topset coved rubber base for installation with surface flooring.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 09 6566 – Synthetic Athletic Flooring.
3. Section 09 6723 - Resinous Flooring.
4. Section 09 6813 – Tile Carpeting.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's published technical data describing materials, construction and recommended installation instructions. Submit technical data and installation instructions for each adhesive material.
- B. Maintenance Instructions: Submit manufacturer's recommendations for maintenance, care and cleaning of base.
- C. Samples: Submit Samples of top set base in each available color. Following color selections, submit Samples, not less than 12 inches long of each selected color and type. Submit pint cans of each type adhesive.
- D. Maintenance Materials: Before Substantial Completion, deliver at least 50 lineal feet and five outside corner units of each color of rubber base installed. Deliver the materials in unopened factory containers or in sealed cartons with labels identifying the contents, matching installed materials. Include unopened cans of adhesives adequate to install the maintenance materials.

1.03 QUALITY ASSURANCE

- A. Qualifications of Installer: Minimum five years experience in successfully installing the same or similar flooring materials.
- B. Comply with the following as a minimum requirement:
 1. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.

2. ASTM F1861: Standard Specification for Resilient Wall Base.
3. Comply with current CHPS requirements, www.chps.net.
4. Chemically based products such as sealers, primers, fillers, adhesives, etc. must be approved by Owner's Office of Environmental Health and Safety (OEHS).
5. Each selected color and configuration shall be from same dye lot and color.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered to the Project site in original unopened manufacturer's packaging clearly labeled with manufacturer's name. Store materials at room temperature, but not less than 70 degrees F, for a minimum of 48 hours before installation, unless otherwise indicated in manufacturer's printed instructions.

1.05 PROJECT CONDITIONS

- A. Ventilation and Temperature: Verify areas that are to receive rubber base are ventilated to remove fumes from installation materials, and areas are within temperature range recommended by the various material manufactures for site installation conditions.

1.06 WARRANTY

- A. Manufacturer shall provide a five year material warranty.
- B. Installer shall provide a two year fabrication and installation warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Burke/Mercer Wall Base.
- B. Roppe, Pinnacle Rubber Base.
- C. Flexco Company, Wallflower Premium Rubber Wall Base.
- D. Johnsonite.
- E. Equal.

2.02 MATERIALS

- A. Rubber base: Conform to ASTM F 861; Group 2, solid (homogeneous); Type 1, TS, (thermoset) vulcanized rubber, Style A, 4-inch high unless otherwise indicated, integral colors as selected, non-shrinking, 1/8 inch thick, with matching molded outside corners.

- B. Base Adhesive: Water based, low odor type, as recommended by manufacturer of rubber base.

PART 3 - EXECUTION

3.01 COORDINATION

- A. Coordinate the Work of this section with other sections to provide a level, smooth and clean finish surfaces to receive rubber base.

3.02 EXAMINATION

- A. Field verify dimensions and other conditions affecting the Work of this section before commencing the Work of this section.
- B. Before Work is started, examine surfaces that are to receive rubber base. Deficiencies shall be corrected before starting the Work of this section.

3.03 PREPARATION

- A. Do not start preparation until adjacent concrete floor slabs are at least 90 days old and finish flooring is installed.
- B. Install rubber base when ambient temperature is 70 degrees F. or higher.

3.04 INSTALLATION

- A. Install top set base at hard floors, including resilient flooring, concrete and wood, carpet and other soft floors.
- B. Securely fasten cement base to backing in long lengths in accordance with manufacturer's recommendations. Lay out lengths so that not less than 18 inches long filler pieces are provided. Assure that top and toe continuously contact the wall and floor, and that all joints are tight. Install matching factory formed external corners at all offsets. Inside corners shall be coped; wrapped corners are not acceptable.
- C. Use of adhesive gun is prohibited. Apply adhesive directly to substrate using the appropriate notched trowel or spreader according to manufacturer's instructions. Maintain 1/8 inch gap from top of base to prevent adhesive oozing onto adjacent surfaces.
- D. Base and outside corners shall be rolled with a seam roller before adhesive sets.

3.05 CLEANING

- A. Maintain surfaces of base clean as installation progresses. Clean rubber base when sufficiently seated and remove foreign substances.
- B. Clean adjacent surfaces of adhesive or other defacement. Replace damaged and/or defective Work to the specified condition.

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3.06 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.07 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 6523
LUXURY VINYL TILE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Luxury vinyl tile flooring as indicated.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 3000 - Cast-in-Place Concrete.
3. Section 09 6518 - Rubber Flooring
4. Section 09 0561 - Moisture Testing for Flooring Installation.
5. Section 09 6513 - Rubber Base.
6. Section 12 4813 – Entrance Floor Mats and Frames.

1.02 DEFINITIONS

- A. Pop-up: A pop-up is defined as any surface deviation or looseness of substrate that is equal to or greater than 1/64 (0.015625) inch above the concrete floor level, regardless of the size.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's published technical data describing materials, construction and recommended installation instructions. Submit technical data and installation instructions for each adhesive material. Submit list and Product Data of recommended finish materials.
- B. Maintenance Instructions: Submit manufacturer's recommendations for maintenance, care, and cleaning of luxury vinyl tile.
- C. Samples: Submit Samples of luxury vinyl tile and any reducers or transitions in each available color and pattern. Following color selections, submit full size samples of each selected color and pattern. Submit pint cans of each type of adhesive.
- D. Maintenance Materials: Before Substantial Completion, deliver a minimum of 5%, or one unopened container of each color and pattern of luxury vinyl tile in each color and pattern installed. Label each container indicating locations installed. Include unopened cans of adhesives adequate to install the maintenance materials.

- E. Installer's Experience Qualifications: Submit list of not less than five projects, extending over period of not less than five years, indicating installer's experience record. Submit letter from manufacturer indicating manufacturer's approval for installer of the products.

1.04 QUALITY ASSURANCE

- A. Qualifications of Installer: Minimum five years' experience in successfully installing the same or similar flooring materials.
- B. Qualifications of Supervising Installer: In addition to the qualifications of the installer listed above, the flooring installer's supervisor shall have a minimum of 10 hours Cal-OSHA safety training.
- C. Pre-Installation and Progress meetings: Prior to start of work of this section and after approval of submittals, schedule on-site meetings between Contractor, Supervising Installer, OAR and Project Inspector to review installation and procedures required for project.
- D. Comply with the following as a minimum requirement:
 1. Materials shall be compliant with requirements of CBC Chapter 11B and ADAAG.
 2. ASTM E84: Class A Flame Spread Rating of 25 or less.
 3. Moisture Testing: ASTM F1869 and ASTM F2170.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered to the Project site in original unopened manufacturer's packaging clearly labeled with manufacturer's name.
- B. Materials shall be stored at room temperature, but not less than 70 degrees F for not less than 48 hours before installation, unless manufacturer's instructions specify otherwise.

1.06 PROJECT CONDITIONS

- A. Ventilation and Temperature: Verify areas that are to receive new flooring are ventilated to remove fumes from installation materials. Verify that areas are within temperature range recommended by the various material manufactures for Project site installation conditions.

1.07 WARRANTY

- A. Manufacturer shall provide a twenty-year wear material warranty.
- B. Installer shall provide a five-year fabrication and installation warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Interface – 25 cm x 1 m planks, level set 4.5mm
- B. Karndean – Long Board 4.5mm
- C. Catalina Products International (CPI) -Avalon 5mm
- D. Milliken – Fortified Foundations 5.0mm, Local Measure 5.0mm, Lumenology 5mm and Quite life
- E. Or equal.

2.02 MATERIALS

- A. Luxury Vinyl Tile: Conform to ASTM F1700, Class III (printed film vinyl), type A, 9-inch by 24-inch up to 1 by 39 inches up to 48-inch (25 cm x 1m) by minimum 4.5 mm thick, colors and patterns as indicated on Drawings. Minimum of 20 mil wear layer
- B. Crack Filler and Leveling Compound: 100 percent cementitious binder type (as defined by ASTM C150), shall be approved by Owner's Office of Environmental Health and Safety (OEHS). The following manufacturers are currently listed approved by OEHS:
 - 1. Shonox SL
 - 2. Ardex SD-F.
 - 3. Mapei Planiprep SC
 - 4. Equal, as recommended by flooring manufacturer and approved by OEHS.
 - 5. Leveling Compound shall meet or exceed 200 pounds when tested in accordance with ASTM C1583.
- C. Concrete Primer: Non-staining type recommended by manufacturer of luxury vinyl tile.
- D. Adhesive: Water based, low odor type formulated specially for installation with luxury vinyl tile, recommended by manufacturer.
- E. Reducer Strips: Tapered rubber not less than one inch wide, and thickness to match tile.

PART 3 - EXECUTION

3.01 TESTING

- A. Refer to Section 09 0561 - Moisture Testing for Flooring Installation.

3.02 COORDINATION

- A. Coordinate with related Work to assure level, dry, smooth, and clean finish surfaces to receive luxury vinyl floor tile.

3.03 EXAMINATION

- A. Field verify and correct deficiencies of conditions affecting Work before commencing Work of this section.

3.04 PREPARATION OF CONCRETE SLABS

- A. Do not start preparation until underlying concrete floor slabs are at least 90 days old. Any leveling compound under a vapor or moisture barrier shall be warranted to be installed in a wet or moist environment without moisture limitations.
- B. Leveling: Check sub-floors for true to level and plane within the tolerance listed in Manufacturer's installation instructions. Test floor areas both ways with a 10-foot straightedge and repair high and low areas exceeding allowable tolerance. Pop ups shall be hammered out and floor filled with an approved cementitious leveling compound. Remove high areas by power sanding, stone rubbing or grinding, chipping off and filling with an approved leveling compound, or equivalent method. Fill low areas with an approved leveling compound. Repair and level surfaces having abrupt changes in plane, such as trowel marks or ridges, whether or not within allowable tolerance. Clean areas where repairs are performed.
- C. Cracks or Depressions: Fill voids with an approved cementitious leveling compound of the type recommended by flooring manufacturer for the specific Work conditions.
- D. Cleaning: After leveling, clean substrates of deleterious substances and foreign matter.

3.06 INSTALLATION OF TILE

- A. Color and pattern: Install tiles in the pattern indicated on Drawings. If no pattern is indicated, tiles shall be installed in a rectangular pattern, in one color.
- B. Install luxury vinyl floor tile when ambient temperature is 70 degrees F or higher or manufacturer's range.
- C. Install the tile adhesive in a thin film evenly with a notched trowel. Trowel notches shall be as recommended by adhesive manufacturer.
 - 1. Mix adhesive in accordance with manufacturer's instructions.
 - 2. Install adhesive only in area that can be covered by flooring material within the adhesive manufacture's recommended working time. Adhesive application rate shall be as required to avoid telegraphing trowel lines to the surface after maintenance coatings are applied. Adjust tile runoff during installation if necessary.

3. Immediately remove any excess adhesive from the tile surface using the adhesive manufacturer's recommended cleaner and a damp, not wet, cloth.
- D. Provide reducer where floor covering edges are exposed, such as at center of the door or where floor coverings terminate.
 - E. Install tiles symmetrically about centerlines of areas progressing toward walls. Adjust border tiles to be even on all walls or nothing smaller than a 3" piece. Tiles shall be straight and joints close. Tile shall be cut to fit snug door jambs casing, pipes fixtures and walls. No slivers at edges.
 - F. Mechanically cut flooring material to produce square true edges.
 - G. As floor tile is installed and within adhesive's recommended working time, roll with a clean, smooth, 100-pound roller in both directions. As the rolling proceeds, replace any loosened, defective, or damaged tile with new and finish to the specified condition.
 - H. Remove dust, debris, and soil with any combination of sweeping, micro-fiber dust-mopping with a properly treated, non-oily mop and vacuuming.

3.07 CLEANING, NO WAXING, AND COMPLETION

- A. Maintain flooring surfaces clean as installation progresses.
- B. Use a sprayer to mist the area to be cleaned with a neutral cleaning solution prepared in accordance with manufacturer's instructions.
- C. Gently scrub the floor using red or maroon cleaning, not stripping pads, mounted on a single disc, 175 RPM floor machine; or preferably, with a machine that uses horizontally mounted brushes with a counter-rotating spindle motion. Never allow the machine to remain running stationary.
- D. Remove the resulting slurry with a wet vacuum.
- E. Rinse the floor at least four times, each time using a clean mop and clean rinse water. On the first rinse, apply just enough water to keep the floor wet until the solution is picked-up with a vacuum. The next two rinses should be with a fairly well wrung-out, damp mop. The final rinse should produce virtually clean rinse water. Ensure the rinse water is clean throughout the rinsing process. Avoid tracking the floor after the final rinse. Check the floor after the final rinse for any missed areas and re-scrub/rinse as needed. Repeat the rinsing process until all signs of the cleaning solution are removed and the floor shows no sign of haziness or dusting when dry. If the Contractor has lightweight "automatic" floor machines capable of achieving the same result as described above, they may be used in-place of this method. Do not flood or excessively dampen floor at any time.
- F. Allow the Work to dry thoroughly.

- G. Clean adjacent baseboard and other surfaces of adhesive and other materials. Replace damaged or defective Work to the specified condition.

3.08 CLEAN UP

- A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.09 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 6813

TILE CARPETING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Tile carpeting.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 3000 - Cast-In-Place Concrete.
3. Section 09 6513 - Rubber Base.

1.02 SUBMITTALS

A. Shop Drawings: Submit dimensioned layout of carpet tile and details for binder bars.

B. Samples:

1. Submit minimum three labeled carpet tile actual size with proper backing. Carpet style and color as selected by the Owner.
2. Trim and accessories: Submit 12-inch long Samples of each type trim proposed for the Work.

C. Product Data: Submit the following:

1. Carpet tile manufacturer's published technical data fully describing carpet materials, construction, and recommended installation directions.
2. Technical data and installation instructions for each adhesive and sealer material.
3. Carpet tile manufacturer's published instructions for maintenance, care, cleaning and repair of carpet.
4. MSDS on Manufacturers recommended adhesives and primers.

D. Certificate:

1. Submit a certificate from carpet tile manufacturer that materials supplied comply with fire hazard resistance standards specified.
 2. Submit a manufacturer certification that the installer is approved by the manufacture to install the specified product.
- E. Installer's Experience Qualifications: Submit list of not less than five projects with similar scope of work, extending over period of not less than five years, indicating installer's experience record.

1.03 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement:
1. Manufacturer's installation instructions
 2. Materials shall comply with CBC Chapter 11B and ADAAG requirements.
 3. Comply with current CHPS requirements for low emitting materials, www.chps.net.
 4. Chemically based products such as sealers, primers, fillers, adhesives, etc. must be approved by owner's office of the Environmental Health and Safety (OEHS).
 5. Carpet tile must be free of Anti-Microbial Protection.
 6. Comply with ASTM F1869 for moisture testing.
- B. Requirements of Regulatory Agencies: Carpet tile shall meet requirements of federal, state and local regulatory agencies for flammability, static control, or other properties as specified with testing documentation from the manufacturer by a third party laboratory.
- C. Carpet Tile Installation: Comply with CRI 104 - Standard for Installation of Textile Floor Covering Materials.
- D. Each color of carpet tile shall be of the same dye lot.
- E. Qualifications of Installer: Minimum five years experience in successfully installing the same or similar flooring materials.
- F. Pre-Installation and Progress meetings: Prior to start of work of this section and after approval of submittals, schedule an on site Pre-Installation and progress meetings between Contractor, Supervising Installer, OWNER and Project Inspector to review construction, drawings and installation procedures in accordance with the requirements of this specification.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Full cartons of carpet tile shall be packaged and identified by the flooring manufacturer. Distributor, dealer, or vendor cutting, re-packaging, and re-labeling is not permitted.
- B. Store material at least 48 hours at room temperature prior to installation and in accordance to manufacturer's instructions.
- C. Deliver fire-rated materials with testing agency labels and required fire classification numbers attached and legible.

1.05 JOB CONDITIONS

- A. Ventilation and Temperature: Verify areas to be carpeted are ventilated to remove any off gassing from installation materials, and areas are within temperature range recommended by the various material manufacturers for Project site installation conditions. The temperature of a concrete slab must be stabilized above 65 degrees both 12 hours prior to and after the installation. The following environmental conditions inside the building are critical for proper installation. Temperature must be between 65 degrees F and 95 degrees F and the humidity between 10 percent and 65 percent for at least 72 hours before and 72 hours after installation. In addition, any adhesives and primers should be stored under these conditions for a minimum of 24 hours prior to installation.
- B. Protection: Prohibit traffic on carpet for at least 12 hours after installation. Cover carpet with heavy non-staining Kraft paper in areas where the Work of other trades is to be performed and traffic and passage areas. Protect carpet from damage or soiling. Maintain protection in place until Substantial Completion.

1.06 WARRANTY

- A. Contractor shall provide a two year installation warranty.
- B. Manufacturer shall provide a 30 year material warranty as described below:
 1. Delamination Warranty: Carpet tile will not delaminate for a minimum of 30 years from the date of installation.
 2. Zippering Warranty: Carpet tile will not zipper or develop continuous pile yarn runners in the body of the carpet for a minimum of 30 years from the date of Substantial Completion.
 3. Edge Ravel: Carpet tile will not have continuous pile yarn coming out at seams for a minimum of 30 years from the date of Substantial Completion.
 4. Cup, Dish or Dome Warranty: The manufacturer warrants that the carpet tile will not cup, dish or dome for 30 years from the date of Substantial Completion.

- 5. Dimensional Stability Warranty: The manufacturer warrants that the carpet tile will not lose its dimensional stability (namely: growth or shrinkage with glue-down installations) for 30 years due to normal variations in atmosphere, temperature, or humidity
 - 6. Wear Warranty: The manufacturer warrants that the carpet tile will lose no more than 10 percent by weight of the pile fiber during the life of the carpet from the date of Substantial Completion.
- C. Manufacturer shall provide a 10 year material warranty for colorfastness and texture retention.
- 1. Stain and Soil Protection: 10 year stain removal written guaranty.
 - 2. Texture Retention Warranty: The manufacturer warrants that the carpet tile will substantially maintain its physical surface texture against crushing, matting and walking out for 10 years from the date of Substantial Completion.
 - 3. Colorfastness to light: Carpet tile will not fade for 10 years due to exposure to sunlight.
 - 4. Colorfastness to atmospheric contaminants: Carpet tile will not fade for 10 years due to atmospheric contaminants.

1.07 MAINTENANCE

- A. Extra Materials: Provide minimum three cartons of extra materials for each color, pattern, and dye lot of carpet.

PART 2 - PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

- A. Modular Carpet Tile, Heavy Commercial Traffic:
 - 1. BOLYU Contract, Style Tempo Hip Hop TPM09
- B. Adhesives and Primers: As recommended by tile carpeting manufacturer.

2.02 MATERIALS

- A. Carpet tile shall meet the following minimum standards:
 - 1. Pile: 0.195 inch maximum height level loop. No cut pile or cut and loops will be accepted.
 - 2. Dye Method: 85 percent Solution Dyed Method. 15 percent Yarn Dyed.

3. Construction: Maximum 24-inch by 24-inch Modular Carpet Tile. Tufted level loop (no cut or cut loop accepted).
4. Pile / Yarn weight: Minimum 17 ounces per square yard.
5. Minimum Density: Not less than 6,800.
6. Moisture Impervious: Carpet tile shall be unaffected by water and moisture.
7. Static Protection: The manufacturer warrants that the carpet tile will not static discharge in excess of 3.5 KV or under when tested under the AATCC Test Method 134 for the life of the carpet.
8. Carpet tile shall be able to be installed with 5 pounds hydrostatic pressure or better per 1,000 square feet per 24 hours with written documentation from manufacturer, per CRI-104.
9. Fluorochemical Treatment: Minimum of 500 parts per million: per CRI-102; after two hot extractions (AATCC171), minimum 400 Parts per Million per CRI TM-102.
10. Traffic Classification: Class III – Extra Heavy Commercial Traffic (more than 1000-foot traffic per day).
11. GSA Certification: Carpet tiles shall meet or exceed the General Services Administration requirements.
12. Flammability:
 - a. Flooring Radiant Panel: Class I- per ASTM E648
 - b. NBS Smoke Density: Less than 450 per test ASTM E662; NFPA-258
 - c. Flame Resistant: Shall pass Methenamine pill test ASTM E662.
 - d. Materials shall meet requirements of California Proposition 65. In case of fire, no material shall be used that emit gas and is prohibited by California Proposition 65.
13. Run Resistant Strength: Not less than 25 pounds, in accordance with the Loop Pile Run Resistance test (TP 155-86), wet or dry for a minimum of 30 years.
14. Indoor Air Quality: Carpet tile and adhesion systems shall meet or exceed CRI and EPA guidelines (green label plus certified and labeled) and may not contain any VOC's such as: 4PCH (4 phenylcyclohexeneor, SBR latex (Styrene Butadiene Rubber).
15. Recycling Program: Carpet tile shall be eligible for a recycling program (the carpet tile will be recycled and no part of the reclaimed carpet enters a landfill)

either through the carpet tile manufacturer or fiber manufacturer. If project scope included removal and disposal of existing carpet or carpet tile, contractor is responsible for delivery to a certified recycling center. A recycling certificate must be submitted to OAR, with its name and address of location of recycling center, date and weight of carpet recycled. Contractor is responsible for costs associated with recycling.

- B. Carpet tile shall be from one dye lot.
- C. Full cartons of carpet tile shall be cut, packaged, and identified by the factory. Distributors, dealers and vendor cutting, re-packaging, and re-labeling are not permitted.
- D. Stair Nosing: Universal Moldings # A-544-BA 1 commercial (butt to nosing) type or equal, installed with recommended sized screws.
- E. Adhesive: Water-resistant latex-based adhesive recommended by carpet tile manufacturer for re-leasable adhesive carpet tile installation. Where primers or sealers are furnished, verify their compatibility with adhesive.
- F. Crack Filler and Leveling Compound: 100 percent cementitious binder type (as defined by ASTM C150), shall be approved by Owner's Office of Environmental Health and Safety (OEHS). The following manufacturers are currently listed as approved by OEHS:
 - 1. Webcrete #95 as manufactured by Durabond
 - 2. Ardex SD-F as manufactured by Ardex
 - 3. Or as recommended by flooring manufacturer and approved by LAUSD's Office of Environmental Health and Safety.
 - 4. Leveling Compound shall meet or exceed 200 pounds when tested in accordance with ASTM 1583.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Before installation is started, examine surfaces to receive carpet tile. Deficiencies shall be corrected before starting Work of this section.
- B. Field verify dimensions and other conditions affecting this Work before commencing carpet tile installation.

3.02 PREPARATION

- A. Provide concrete moisture vapor emission and pH testing to concrete specified to be covered with carpet tile. Includes concrete placed below, on and above grade. For replacement projects, concrete slabs not in direct contact with ground may be excluded from this requirement. Comply with requirements of ASTM F1869.
- B. Testing shall take place after allowing concrete to dry for a minimum of 90 days. Testing to be scheduled no less than one or more than three weeks prior to scheduled flooring installation.
- C. Quantification of Concrete Moisture Vapor Emissions
 1. The test site should be maintained at the same temperature and humidity conditions as those anticipated during normal occupancy. These temperature and humidity levels should be maintained for 48 hours prior and during test period. If meeting this criteria is not possible, then minimum conditions should be 75 plus or minus 10 degrees F and 50 plus or minus 10 percent relative humidity. When a building is not under HVAC control, a recording hygrometer or data logger shall be in place recording conditions during the test period. A transcript of this information must be included with the test report.
 2. The number of vapor emission test sites is determined by the square footage of the facility. The minimum number of tests to be placed is equal to three in the first 1,000 square feet and one per each additional 1,000 square feet.
 3. Tests sites are to be cleaned of adhesive residue, curing compounds, paints, sealers, floor coverings, etcetera 24 hours prior to the placement of test kits.
 4. Weigh test dish on site prior to start of test. Scale must report weight to 0.1 grams. Record weight and start time.
 5. Expose Calcium Chloride and set dish on concrete surface.
 6. Install test containment dome and allow test to proceed for 72 hours.
 7. Retrieve test dish by carefully cutting through containment dome. Close and reseal test dish.
 8. Weigh test dish on site recording weight and stop time.
 9. Calculate and report results as “pounds of emission per 1,000 square feet per 24 hours”.
 10. Follow manufacturer’s corrective measures accordingly. Moisture vapor emission must meet manufacture’s recommendation prior to installation.
- D. Quantification of pH Level

1. At each vapor emission test site, after removal of test containment dome, perform pH test.
 - a. Place several drops of water onto the concrete surface to form a puddle approximately 1 inch in diameter.
 - b. Allow the water to set for approximately 60 seconds
 - c. Dip the pH paper into the water and remove immediately, compare color to chart provided by paper supplier to determine pH reading
 - d. Acceptable range is pH5 to pH9. Excessive alkalinity shall be neutralized prior to installation of the carpet tile.
 - e. Record and report results.
 - f. Follow manufacturer's corrective measures accordingly.

- E. Preparation of Subfloors: Any leveling compound used over a vapor or moisture barrier will be warranted to be installed in a wet or moist environment without moisture limitations.
 1. Delay application of flooring until sub-floors are sufficiently dry according to flooring manufacturer's recommendations, or perform remedial measures as recommended by flooring materials manufacturer.

- F. Cleaning and Drying: Clean concrete floor slabs of oil, grease, waxes, curing compounds, dust, dirt, debris, paint, and other deleterious substances. Failure to remove or seal old adhesives or other floor coatings may result in installation failure. Provide a commercial vacuum cleaner to remove dust and dirt. Do not furnish oiled or chemical treated sawdust or any similar product for dust removal.

- G. Leveling: Verify floor slabs true to level and plane within a tolerance of 3/16 inch in 10-feet. Test floor areas both ways with a 10-foot straightedge and repair high and low areas exceeding allowable tolerance. Pop ups shall be hammered out and floor filled with an approved cementitious leveling compound. Remove high areas by power sanding, stone rubbing or grinding, chipping off and filling with an approved cementitious leveling compound, or equivalent method. Fill low areas with an approved cementitious leveling compound. Repair and level the surfaces having abrupt changes in plane, such as trowel marks or ridges, whether or not within the allowable tolerance. Again clean areas where repairs are performed and prime floor using recommended primer by manufacture. Do not sand, stone rub grind or power chip floor adhesives that contain asbestos.

- H. Wood subfloors: Clean wood subfloors of oil, grease, waxes, dust, dirt, debris, paint, and other deleterious substances. Do not furnish oiled or chemical treated sawdust or any similar product for dust removal. Sand off projecting ridges. If recommended by

carpet tile manufacturer, prime floors with a recommended primer, compatible with adhesives to be installed.

- I. Conditioning of Materials: Carpet tile and adhesives shall be conditioned at the Project site at not less than 65 degrees F and relative humidity between 10 percent and 65 percent for 48 hours prior to installation and in accordance to manufacturer's instructions.
- J. Floors should be level and sound. Any trowel marks from old adhesives must be sanded smooth, creating a level surface prior to the application of adhesives and primers.

3.03 CARPET TILE INSTALLATION

- A. General: Install carpet tile in accordance with requirements of CRI 104, except where more stringent requirements are specified herein or recommended by carpet materials manufacturers.
- B. Install carpet tiles in each dye lot in the number sequence as furnished by manufacturer. Measure the area to find the best starting point that will utilize a maximum size perimeter tile. After selecting the starting point, snap a chalk line that bisects this point by at right angles. To achieve a perfect angle form a triangle by measuring 6-inch up from the center point. Then measure 8-inch out from the center point. Then, find a 10-inch angle between these two points. (See manufacturers written instructions for complete details).
- C. Color Control: Install dye lot in the number sequence at locations indicated to prevent shading variations. Install only one dye lot for each area of building unless otherwise reviewed. If more than one dye lot is required, obtain prior review of color match between dye lots by Owner and its representative's written approval.
- D. Carpet Tile Fit: Refer to the layout Shop Drawings. The corners of the carpet tiles should be flat to assure a proper fit. Install the carpet tiles snugly. Be careful to not to over tighten the installation.
- E. Laying and Seaming: Cut carpet tiles for seams between rows and prevent damage to loops, prevent edge ravel, and preserve uniform row alignment and spacing on both sides and across seams. Install carpet tiles with loop rows in straight lines both ways, free of offsets, waviness, distortion, or misalignment. Cut seam edges straight and square with backing. Trim carpet tiles at walls, columns, and penetrations for a compressed fit.
- F. Doorways: Extend carpet tiles into doorways without piecing in and seam to the carpet on other side of door under door centerline except where metal thresholds occur; no small filler pieces of carpet tiles will be permitted at doorways.
- G. Adhesive Installation: Provide proper equipment as required by manufacturer. Evenly spread adhesive free of excess or thin areas. Place and lay carpet tile within open time of adhesive.

- H. Binder Bars: Provide bars at edges of carpet tiles not abutting walls or other construction, securely fastened in place by using aluminum drive nails. Precisely align splices and tightly miter angles.

3.04 PROTECTION

- A. Protect the Work of this section until Substantial Completion. Limit rolling traffic on carpet tiles for at least 12 hours after installation. Cover carpet tiles with heavy non-staining Kraft paper in areas where the Work of other trades is to be performed and/or traffic and passage areas. Protect carpet from damage or soiling. Maintain protection in place until Substantial Completion.

3.05 CLEANING

- A. As each carpeted area is completed, clean up dirt and debris, remove spots and soiling with proper cleaner, trim off loose threads with sharp scissors, and vacuum entire area clean.

3.06 CLEAN-UP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.07 INSTRUCTION

- A. Before Substantial Completion of the Work, should the district request and at the districts discretion, provide a four hour Owner instruction period for proper maintenance of carpeting. Instructions shall be provided by technical representative of manufacturer.

END OF SECTION

SECTION 09 9000
PAINTING AND COATING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Interior and exterior painting.

B. Following items shall not be painted:

1. Brass valves, chromium or nickel-plated piping and fittings.
2. Boiler control panels and control systems.
3. Fabric connections to fans.
4. Flexible conduit connections to equipment, miscellaneous name plates, stamping, and instruction labels and manufacturer's data.
5. Mechanical and electrical utility lines, piping and heating and ventilation ductwork in tunnels, under-floor excavated areas or crawl spaces, attic spaces and enclosed utility spaces.
6. Flag, floodlight, parking light poles and loudspeaker poles, metal stairs, handrails and chain-link fence with a galvanized finish, unless otherwise noted.
7. Structural and miscellaneous steel, open web steel joists and metal floor decking, which will not be exposed in final construction, shall have no finish other than one coat of shop primer.
8. Hardboard covering on tops and backs of counters and benches.
9. Brass, bronze, aluminum, lead, stainless steel and chrome or nickel-plated surfaces.
10. Non-metallic walking surfaces unless specifically shown or specified to be painted.

1.02 REGULATORY REQUIREMENTS

- A. Paint materials shall comply with the Food and Drug Administration's (F.D.A.) Lead Law and the current rules and regulations of local, state and federal agencies governing the use of paint materials.

1.03 SUBMITTALS

- A. List of Materials: Before submittal of samples, submit a complete list of proposed paint materials, identifying each material by distributor's name, manufacturer's name, product name and number, including primers, thinners, and coloring agents, together with manufacturers' catalog data fully describing each material as to contents, recommended installation, and preparation methods. Identify surfaces to receive various paint materials.
- B. Material Samples: Submit manufacturer's standard colors samples for each type of paint specified. Once colors have been selected, submit Samples of each color selected for each type of paint accordingly:
 - 1. Samples of Paint and Enamel must be submitted on standard 8 ½" x 11" Leneta Opacity-Display Charts. Each display chart shall have the color in full coverage. The sample shall be prepared from the material to be installed on the Work. Identify the school on which the paint is to be installed, the batch number, the color number, the type of material, and the name of the manufacturer.
 - 2. Elastomeric shall be submitted in duplicate samples of the texture coating. Samples will be not less than 2 ½ by 3 ½ in size and installed upon backing. Finished Work will match the reviewed Sample in texture.
 - 3. Materials and color samples shall be reviewed before starting any painting.
- C. For transparent and stained finishes, prepare samples on same species and quality of wood to be installed in the Work, with written description of system used.

1.04 QUALITY ASSURANCE

- A. Certification of Materials: With every delivery of paint materials, the manufacturer shall provide written certification the materials comply with the requirements of this section.
- B. Coats: The number of coats specified is the minimum number. If full coverage is not obtained with the specified number of coats, install additional coats as required to provide the required finish.
- C. Install coats and undercoats for finishes in strict accordance with the recommendations of the paint manufacturer as reviewed by the Architect.
- D. Paint materials shall comply with the following as a minimum requirement:
 - 1. Materials shall be delivered to Project site in original unbroken containers bearing manufacturer's name, brand number and batch number.
 - 2. Open and mix ingredients on premises in presence of the Project Inspector.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Storage and Mixing of Materials: Store materials and mix only in spaces suitable for such purposes. Maintain spaces clean and provide necessary precautions to prevent fire. Store paint containers so the manufacturer's labels are clearly displayed.

1.06 SITE CONDITIONS

- A. Temperature: Do not install exterior paint in damp, rainy weather or until surface has thoroughly dried from effects of such weather. Do not install paint, interior, or exterior, when temperature is below 50 degrees F, or above 90 degrees F, or dust conditions are unfavorable for installation.

1.07 WARRANTY

- A. Manufacturer shall provide a three year material warranty.
B. Installer shall provide a three year application warranty.

1.08 MAINTENANCE

- A. Provide at least one gallon of each type, color and sheen of paint coating installed. Label containers with color designation indicated on Drawings.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS

- A. Furnish the products of only one paint manufacturer unless otherwise specified or required. Primers, intermediate and finish coats of each painting system must all be the products of the same manufacturer, including thinners and coloring agents, except for materials furnished with shop prime coat by other trades.
B. Factory mix paint materials to correct color, gloss, and consistency for installation to the maximum extent feasible.
C. Paint materials to be minimum "Architectural Grade".
D. Gloss degree standards shall be as follows:

HIGH GLOSS	70 and above	EGGSHELL	30 to 47
SEMI-GLOSS	48 to 69	SATIN	15 to 29

2.02 MANUFACTURERS

- A. Acceptable manufacturers, unless otherwise noted:
1. Dunn-Edwards Corporation Paints
 2. Frazee Paints and Wall coverings
 3. Vista Paints
 4. Sherwin Williams
 5. ICI Paints

- 6. Equal.
- B. Exterior steel:
 - 1. Carboline
 - 2. Equal.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine surfaces to receive paint finish. Surfaces which are not properly prepared and cleaned or which are not in condition to receive the finish specified shall be corrected before prime coat is installed.
- B. New woodwork shall be thoroughly cleaned, hand sandpapered, and dusted off. Nail holes, cracks or defects in Work shall be filled. On stained woodwork, fill shall be colored to match stain. Filling shall be performed after the first coat of paint, shellac or varnish has been installed.
- C. Plaster surfaces except veneer plaster shall be allowed to dry at least 3 weeks before painting. Veneer plaster shall be allowed to dry sufficiently to receive paint as determined by moisture meter tests.
- D. Metal surfaces to be painted shall be thoroughly cleaned of rust, corrosion, oil, foreign materials, blisters, and loose paint.
- E. Do not install painting materials to wet, damp, dusty, dirty, finger marked, rough, unfinished or defective surfaces.
- F. Concrete surfaces shall be dry, cleaned of dirt and foreign materials and in proper condition to receive paint. Neutralize spots demonstrating effects of alkali.
- G. Mask off areas where necessary.

3.02 APPLICATION

- A. Backpainting: Immediately upon delivery to the Project site, finish lumber and millwork shall be backpainted on surfaces that will be concealed after installation. Items to be painted shall be backpainted with priming coat specified under "Priming".
- B. Priming: New wood and metal surfaces specified to receive paint finish shall be primed. Surfaces of miscellaneous metal and steel not embedded in concrete, and surfaces of unprimed plain sheet metal Work shall be primed immediately upon delivery to the Project site. Galvanized metal Work and interior and exterior woodwork shall be primed immediately after installation. Priming of surfaces and priming coat shall be as follows:
 - 1. Knots, Pitch and Sap Pockets: Shellac before priming.

2. Exterior Woodwork and Wood Doors: Prime with one coat of exterior waterborne emulsion wood primer.
 3. Interior Woodwork: Where indicated to be painted, prime with one coat of waterborne wood primer.
 4. Stain: Woodwork indicated to receive a stain and varnish finish shall be stained to an even color with water borne stain. On open-grained hardwood, mix stain with paste filler and completely fill pores in wood.
 5. Galvanized Metal Work: Remove all soluble and insoluble contaminants and corrosion. Remove any storage stains per Section 6.2 of ASTM D6386. Chemically treat with Krud Kutter ME or Great Lakes Laboratories Clean & Etch or Equal, in accordance with manufacturer's written instructions. Ensure that all surfaces have been effectively and uniformly treated per the manufacturer's recommendation. Follow manufacturer's instructions for drying time, and then prime with one coat of Cycloaliphatic Amine Epoxy.
 6. Unprimed Iron, Steel, and Other Uncoated Metals: Where specified to be painted, prime with one coat of metal primer.
 7. Shop Primed Metal Items: Touch up bare and abraded areas with metal primer before installation of second and third coats.
 8. Coats shall be installed evenly and with full coverage. Finished surfaces shall be free of sags, runs and other imperfections.
- C. Allow at least 24 hours between coats of paint.
- D. Rollers shall not be used on wood surfaces.
- E. Each coat of painted woodwork and metal, except last coat, shall be sandpapered smooth when dry. Texture-coated gypsum board shall be sanded lightly to remove surface imperfections after first coat of paint has been installed.
- F. Each coat of paint or enamel shall be a slightly different tint as required. Each coat of paint, enamel, stain, shellac, and varnish will be inspected by the IOR before next coat is applied. Notify the Project Inspector that such Work is ready for inspection.
1. Tinting Guideline: The first coat, primer/undercoat(s) to be untinted or tinted up to 50 percent lighter or darker (at the discretion of the installer) than the finish coat. The second coat (or third coat if a seal coat and undercoat have been specified) is to be factory tinted in the range of 10 percent to 15 percent lighter or darker (at the discretion of the installer) than the finish coat. The final coat is to be factory tinted to the required color selected. These tinting guidelines shall be provided on all surfaces receiving paint.
- G. Do not "paint-out" UL labels, fusible links and identification stamps.
- H. Paint Roller, brush and spray.

1. Only Paint rollers shall be used on interior plaster, drywall, masonry/plaster and plywood surfaces, nap shall not exceed one half inch in length.
 2. First coat on wood overhang and ceilings shall have material applied by roller and then brushed out in a professional manner to leave surface free of imperfections. Finish coat may be sprayed.
 3. Other surfaces shall have all coatings applied with brushes of proper size.
 4. Spray work is permitted only on radiators, acoustic plaster, masonry and plaster.
- I. Where ceilings are specified to be painted, beams, cornices, coves, ornamental features, plaster grilles, etc. shall be included.
 - J. Ceilings shall be white, including classrooms, storage rooms, offices, arcades, etc. Boiler room and fan room ceiling color shall match adjacent walls.

3.03 CLEANING

- A. Remove rubbish, waste, and surplus material and clean woodwork, hardware, floors, and other adjacent Work.
- B. Remove paint, varnish and brush marks from glazing material and, upon completion of painting Work, wash and polish glazing material both sides. Glazing material, which is damaged, shall be removed and replaced with new material.
- C. Clean hardware and other unpainted metal surfaces with recommended cleaner. Do not furnish abrasives or edged tools.

3.04 SCHEDULE

- A. Interior:
 1. Woodwork, Painted: 3 coats.
 - a. First Coat: As specified in this section under Priming.
 - b. Second and Third Coats: Interior enamel, semi-gloss or gloss as indicated.
 2. Woodwork, Stained and Varnished: 4 coats.
 - a. First Coat: As specified in this section under Priming.
 - b. Second, Third and Fourth Coats: Varnish, semi-gloss.
 3. Wood Corridor doors: 4 coats.
 - a. First Coat: As specified in this section under Priming.
 - b. Second, Third, and Fourth Coats: Varnish, gloss.

4. Other Wood Doors: 4 coats.
 - a. Varnished or painted as indicated.
 - b. If varnished, same finish system as painted woodwork, with semi-gloss or gloss finish to match adjacent wall.
5. Miscellaneous Woodwork: 4 coats. Wood items including, but not limited to: stair treads and risers, handrails, rolling ladders, wood base and shoe, chair rails, counter tops and locker room benches.
 - a. First Coat: As specified in this section under Priming.
 - b. Second, Third and Fourth: Exterior varnish, gloss.
6. Casework: Interior surfaces of casework (except plastic laminate-faced casework) including top, edges and underside of shelving, poles, surfaces of drawers (except fronts), interior surfaces of mailbox pigeonholes, and particle board.
 - a. First Coat: Waterborne stain.
 - b. Second and Third Coats: Satin varnish.
7. Plaster: 4 coats.
 - a. First Coats: Pigmented wall sealer.
 - b. Second coat: Enamel under coater.
 - c. Third and Fourth Coats – Interior enamel, semi-gloss or gloss as indicated.
8. Gypsum Board: 4 coats.
 - a. First Coat: Drywall sealer.
 - b. Second Coat: Enamel under coater.
 - c. Third and Fourth Coats: Interior enamel, semi-gloss or gloss as indicated.
9. Concrete: 3 coats.
 - a. First: Concrete sealer.
 - b. Second and Third: Interior enamel, semi-gloss or gloss as indicated.
10. Concrete Block: 3 coats.
 - a. First: Concrete block filler.

- b. Second and Third: Interior enamel, semi-gloss or gloss as indicated.
 - 11. Metal: Shall be cleaned, pre-treated and painted with 3 coats. Items to be painted include, but are not limited to: exposed structural and miscellaneous steel, railings and handrails, metal doors and frames, ladders, table and bench legs.
 - a. First Coat: Cycloaliphatic Amine Epoxy.
 - b. Second and Third Coats: Aliphatic Acrylic-Polyester Polyurethane.
- B. Exterior:
 - 1. Woodwork: 3 coats.
 - a. First Coat: As specified in this section under Priming.
 - b. Second and Third Coats: Exterior house and trim enamel.
 - 2. Wood Doors: 3 coats.
 - a. First Coat: As specified in this section under Priming.
 - b. Second and Third Coats: Exterior gloss enamel.
 - 3. Plaster and Stucco: 3 coats. Flat 100 percent acrylic.
 - a. Prime Coat: Alkali resistant primer/sealer.
 - b. Exterior 100 percent acrylic.
 - 4. Concrete: 3 coats. Flat 100 percent acrylic.
 - a. First Coat: Concrete sealer.
 - b. Second and Third Coats: Exterior 100 percent acrylic.
 - 5. Metal: 3 coats. Shall be cleaned and pre-treated. Items to be painted include, but are not limited to: steel columns and miscellaneous steel items, railings and handrails gravel stops, metal doors and frames, hoods and flashings.
 - a. First Coat: Cycloaliphatic Amine Epoxy.
 - b. Second and Third Coats: Aliphatic Acrylic-Polyester Polyurethane.
- C. Mechanical and Electrical Work:
 - 1. Except where interior mechanical and electrical Work to be painted is specified to receive another paint finish, Work occurring in finished rooms and spaces shall be cleaned, pre-treated, and painted with 3 coats. Items to be painted include, but are not limited to: steel and copper piping, pipes, vents, fittings, ducts, plenums, miscellaneous supports and hangers, electrical conduit, fittings,

pull boxes, outlet boxes, unfinished surfaces of plumbing fixtures, miscellaneous metal cabinets, panels, and access doors and panels.

- a. First Coat: As specified in this section under Priming.
 - b. Second and Third Coats: Interior enamel, semi-gloss or gloss to match adjacent wall or ceiling finish.
2. Insulation and Taping on Pipes and Ducts: 3 coats.
 - a. Finished Rooms:
 - 1) First Coat: Interior waterborne primer.
 - 2) Second and Third Coats: Interior semi-gloss or gloss enamel to match adjoining wall or ceiling finish.
 - b. Building Exterior:
 - 1) First Coat: Exterior waterborne primer.
 - 2) Second and Third Coats: Exterior gloss enamel.
 3. Inside surfaces of ducts, vents, dampers and louvers as far back as visible from room in which they open shall be painted with 2 coats of flat black paint.

D. Miscellaneous:

1. Outside Storage Units (wood or metal): 3 coats.
 - a. First Coat: As specified in this section under Priming.
 - b. Second and Third Coats: Exterior gloss enamel.
2. Exterior and interior surfaces of storage bins, and potting tables shall have 3 coats of acrylic stain.
3. Wood compost bins shall be finished with 3 coats of acrylic stain.

3.05 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.06 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 09 9643
EPOXY FLOOR COATING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Abrasion and chemical-resistant coating over interior concrete floors.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 03 3000 - Cast-In-Place Concrete.

1.02 SUBMITTALS

- A. Installation Instructions: Submit manufacturer's recommended instructions for installation of chemical-resistant sealer for interior concrete floors.
- B. Certificates: Furnish certification that materials meet Specification requirements.
- C. Closeout Submittals: Submit manufacturer's recommended maintenance instructions.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in manufacturer's original containers with seals and labels intact.
- B. Store materials in enclosed space protected from weather and out of direct rays of sun.
- C. Store materials above grade.
- D. Maintain storage temperature as recommended by manufacturer.

1.04 PROJECT CONDITIONS

- A. Do not mix or install materials when temperature is less than that recommended by manufacturer.

PART 2 - PRODUCTS

2.01 COATING

- A. Manufacturers:
 - 1. BASF, Selbaclad 425.

2. Jones-Blair/Neogard, FloorTuff.
 3. Equal.
- B. Composition: Two-component catalyzed epoxy resin coating.
 - C. Color: Gray.
 - D. Coverage: 250 square feet per gallon per coat.
 - E. Drying Time: Allow drying time between coats as recommended by manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Sealer shall be mixed in strict accordance with manufacturer's instructions.
- B. Concrete shall be cured at least 30 days before installation of sealer.
- C. Surface Preparation:
 1. Holes, crevices, spalled or disintegrated areas shall be properly patched or filled.
 2. Surface shall be free of soil, dust, base material, oil, grease, paint, curing compounds and other foreign matter.
 3. Surface shall be cleaned and allowed to dry thoroughly. Cleanse dirty or contaminated floors with a recommended cleaner as per manufacturer's directions. Rinse thoroughly with clean water.
 4. Acid etch the floor with 1:1 solution by volume of 18-20 Baume muriatic acid and water. Install and allow to stand until bubbling ceases.
 5. Rinse with clean water and squeegee until damp.
 6. Repeat rinsing operation to remove acid. Allow to dry before coating with sealer.
 7. Floors shall be absolutely dry in accordance with manufacturer's instructions.
- D. Application:
 1. Thin first coat using "Reducer 990" as recommended by manufacturer.
 2. First coat should dry to a matte or flat finish, leaving a barely visible coating.
 3. Allow a minimum of five hours drying time between coats.
 4. Install second coat, unthinned, within 24 hours of application of first coat.

3.02 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

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3.03 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 10 1400
SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Interior and exterior accessibility, identification, directional and informational signs.
2. Parking signs.

B. Related Requirements:

1. Division 01: General Requirements.
2. Section 08 1113: Hollow Metal Doors, Windows and Frames.
3. Section 08 1416: Wood Doors.
4. Division 09: Finishes.
5. Section 32 1313 - Site Concrete Work.

1.02 REFERENCES

A. ASTM International:

1. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
3. ASTM D4802 - Standard Specification for Poly (Methyl Methacrylate) Acrylic Plastic Sheet.

1.03 SUBMITTALS

- A. Product Data: Submit material descriptions, finishes and color charts for each type of sign.
- B. Shop Drawings: Submit Shop Drawings indicating sign style, lettering, overall dimensions and quantities. Submit floor plans showing locations for each sign.
- C. Material Samples: Submit three samples illustrating full size sample sign, of type, style and color specified.

- D. Manufacturer’s installation instructions.

1.04 QUALITY ASSURANCE

- A. Pre-Installation Conference: Notify ARCHITECT when signs are ready for installation. Arrange for conference at site. Do not proceed with installation until ARCHITECT’S approval of specific locations and methods of attachment has been obtained.
- B. Provide signs from one manufacturer.
- C. Inspection: Tactile signs shall be field inspected for compliance after installation (11B-703.1.1.2)

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site and protect from damage. Store until immediately prior to installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Products of following manufacturers are acceptable and are the basis for intended design and quality.
 - 1. H. Toji and Company.
 - 2. Karman Ltd., Architectural Signs.
 - 3. Vomar Products Inc.
 - 4. ASI-Modulex, Inc.
 - 5. Mohawk Sign Systems, Inc.
 - 6. Accent Signage Systems.
 - 7. The Gruenke Company.
 - 8. Ada Sign Products.
 - 9. AccuBraille.
 - 10. Equal.

2.02 MATERIALS AND FABRICATION

- A. Interior Sign Materials:

1. Substrate Panel: 1/8 inch minimum thick, integrally colored or clear acrylic plastic, or laminated acrylic. Conforming to ASTM D4802; non-glare (matte), UV stable, suitable for interior and exterior use.
 - a. Corners shall be square.
 - b. Edges shall be square and eased.
 - c. Colors as selected by ARCHITECT from manufacturer's custom color range.
 2. Fasteners:
 - a. Stainless steel tamper-proof screws and plastic anchors.
 - b. Signs mounted on fire-rated doors shall be secured with adhesive.
 - c. Adhesives and sealants shall comply with the limits for VOC content.
- B. Exterior Sign Materials:
1. Sign: ASTM B209 aluminum sheet, 0.080 inch thick with rounded corners of at least 1/8 inch radius and eased edges. White figure on a blue background; non-glare, high contrast signs. The blue shall be equal to color number 15090 in Federal Standard 595C.
 2. Post: 2 by 2 inch galvanized steel tubing, weighing minimum of 4.31 pounds per foot and conforming to ASTM A500, Grade B, 3/16 inch thick wall thickness.
 3. Concrete Post Footings: Refer to Section 32 1313, Site Concrete Work.
 4. Fasteners: Stainless steel carriage bolts with tamper resistant nuts.
- C. Characters and Symbols: Shall be fabricated by one of the processes described below:
1. Computer cut raised characters and graphics shall be cut from 1/16 inch integrally colored acrylic. Raised characters and graphics shall be inlaid 1/32 inch minimum into first surface of sign background, secured with adhesive so it cannot be removed without the use of tools. Raised characters and graphics shall have beveled, eased or rounded edges. Non-tactile text and graphics shall be applied to the second surface, and background color shall be applied to the second surface and protected with film or an additional backplate. Pictograms and other symbols including the International Symbol of Accessibility, which are included on signs with raised characters and Braille, are not required to be raised.
 2. Raised characters and graphics including braille shall be integral to sign face and shall be formed into sign face by high pressure thermoforming using a negative mold. No applied, glued, welded tactile elements are acceptable. Raised characters and graphics shall have beveled, eased or rounded edges. No sharp, square edges are acceptable. Non-tactile text and graphics shall be applied to the second surface, and background color shall be applied to the second surface and

protected with vinyl film. Pictograms and other symbols including the International Symbol of Accessibility, which are included on signs with raised characters and Braille, or other signs are not required to be raised.

2.03 COMMUNICATION ELEMENTS AND FEATURES

- A. Raised Characters Raised characters shall comply with CBC 11B-703.2.
1. Character Type: Characters on signs shall be raised 1/32 inch minimum above their background and shall be sans serif uppercase characters duplicated in Braille. Characters and Braille shall be in a horizontal format.
 2. Character Height: Character height measured vertically from the baseline of the character shall be 5/8 inch minimum and 2 inch maximum based on the height of the uppercase letter "I".
 3. Character Proportions: Characters shall be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the letter "I".
 4. Stroke Thickness: Stroke thickness of the uppercase letter "I" shall be 15 percent maximum of the height of the character.
 5. Character and Line Spacing shall be in conformance to CBC 11B-703.2.7 and 11B-703.2.8.
 6. Character Placement: Shall be placed in accordance to Paragraph 2.03, C below.
- B. Visual Characters: Visual characters shall comply with CBC Section 11B-703.5. Characters shall be conventional in form, and shall be uppercase or lowercase or a combination of both, as indicated on the drawings. Characters shall not be italic, oblique, highly decorative, or of other unusual forms.
1. Finish and Contrast: Characters and their backgrounds shall have a non-glare finish. Characters shall contrast with their background with either light characters on a dark background or a dark characters on a light background.
 2. Character Proportions: Characters shall be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the uppercase of the letter "I".
 3. Character Height: Minimum character height shall comply with CBC Table 11B-703.5.5.
 4. Height from Finish Floor or Ground: Visual characters shall be a 40 inches minimum above the finish floor or ground
 5. Stroke Thickness: Uppercase letter "I" shall be 10 percent minimum and 20 percent maximum of the height of the character.
 6. Character and Line Spacing: Shall be in accordance to CBC 11B-703.5.8 and 11B-703.5.9.

- C. Braille: Contracted Grade 2 Braille, conforming to CBC 11B-703.3. Braille characters shall be inlaid optically correct acrylic Raster beads into computer drilled holes in the panel surface.
1. Dimensions and Capitalization: Braille dots shall have a domed or rounded shape and shall comply with CBC Table 11B-703.3.1. The indication of an uppercase letter or letters shall only be used before the first word of sentences, proper nouns and names, individual letters of the alphabet, initials, and acronyms.
 2. Position: Braille shall be positioned below the corresponding text in a horizontal format, flush left or centered. If text is multi-lined, Braille shall be placed below the entire line of text. Braille shall be separated 3/8 inch minimum and 1/2 maximum from any other tactile characters and 3/8 inch minimum from raised borders and decorative elements.
- D. Pictograms: In conformance to CBC 11B-703.6. Pictograms shall have a field height of 6 inches minimum. Characters and Braille shall not be located in the pictogram field.
1. Finish and Contrast: Pictograms and their field shall have a non-glare finish. Pictograms shall contrast with their field with either a light pictogram on a dark field or a dark pictogram on a light field.
 2. Text Descriptors: Pictograms shall have text descriptors located directly below the pictogram field, and shall comply with CBC 11B-703.2, 11B-703.3 and 11B-703.4.
- E. International Symbol of Accessibility (ISA): Shall comply with CBC 11B-703.7 and CBC Figure 11B-703.7.2.1. The ISA shall consist of a white figure on a blue background. The blue color shall be approximate to FS. 15090 in Federal Standard 595C.
- F. Mounting Locations and Height: Signs with tactile characters shall be as indicated on the drawings and in conformance to CBC 11B-703.4.
1. Mounting Locations:
 - a. Identification signs for rooms and spaces shall be located on the wall adjacent to the latch side of the door, as one enters the room or space.
 - b. Signs that identify exits shall be located at the exit door when approached in the direction of egress travel.
 - c. Signs containing tactile characters shall be located so that a clear floor space 18 inches minimum by 18 inches minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.
 - d. Where a tactile sign is provided at a door, the sign shall be located alongside the door at the latch side.

- e. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located at the inactive leaf.
 - f. Where a tactile sign is provided at double doors with two active leafs, the sign shall be located to the right of the right hand door.
 - g. Where there is no wall space at the latch side of a single door or at the right side of double doors, signs shall be located on the nearest adjacent wall.
2. Mounting height above finish floor or ground: Tactile characters on signs shall be located 48 inches minimum above the finish floor or ground surface, measured from the baseline of the lowest Braille cells and 60 inches maximum above the finish floor or ground surface, measured from the baseline of the highest line of raised characters.

2.04 ROOM IDENTIFICATION SIGNS

A. Room Identification Sign Types:

- 1. Room Identification Sign with Changeable Insert: 7 inches high by 9 inches wide, minimum, with 4 inches high by 9 inches wide window for name and title removable insert. Locate room name immediately below window, and centered above room number. Room name shall be raised characters 3/4 inches high minimum, and room number 1 inch minimum; and shall be accompanied with Braille indicators.

B. Room Identification Sign Requirements:

- 1. Finish and Contrast: Refer to paragraph 2.03.B.
- 2. Raised Characters and Proportions: Refer to paragraph 2.03.A.
- 3. Braille: Refer to paragraph 2.03.C.
- 4. Mounting Location and Height: Refer to paragraph 2.03.F.

2.05 RESTROOM SIGNAGE

A. Multiple-Occupancy restrooms shall be provided with geometric symbols and wall mounted pictograms with text descriptors.

B. Geometric Symbols:

- 1. Doorways leading to toilet rooms shall be identified by a geometric symbol complying with CBC Section 11B-703.7.2.6.
- 2. Male Restroom Door Symbol: 1/4 inch thick equilateral triangle with edges 12 inches long, with vertex pointing upward, the triangle symbol shall contrast with the door, either light on a dark background or dark on a light background.

A male silhouette shall appear within the equilateral triangle in contrasting color to it.

3. Female Restroom Door Sign: 1/4 inch thick circle 12-inch diameter, the circle symbol shall contrast with the door, either light on a dark background or dark on a light background. A female silhouette shall appear within the circle in contrasting color to it.
 4. “All Gender” Restroom Door Sign (Single occupancy restrooms): 1/4 inch thick circle, 12-inch diameter with a 1/4 inch thick equilateral triangle with the vertex pointing upward superimposed on the circle and within the 12-inch diameter. Triangle and circle shall be of contrasting colors; the circle symbol shall contrast with the door. A female and male silhouettes shall appear within the equilateral triangle in contrasting color to it, and the word “restroom” shall appear on the bottom part of the circle in contrasting color to it.
 5. Edges and Vertices on Geometric Symbols: Shall be eased or rounded at 1/16 inch minimum, or chamfered at 1/8 inch maximum. Vertices shall be radiused between 1/8 inch minimum and 1/4 inch maximum.
 6. Location and Mounting Height: Symbols shall be mounted at 58 inches minimum and 60 inches maximum above the finish floor or ground surface measured from the centerline of the symbol. Where a door is provided the symbol shall be mounted within one inch of the vertical centerline of the door.
- C. Room Identification for Multiple-Occupancy Restrooms: Provide a 16 inch long by 6 inch tall room identification sign, including a pictogram of the International Symbol of Accessibility on a side. Restroom names shall be “Women” and “Men” . Characters, Braille, pictograms and mounting locations and height shall be in conformance to Article 2.03.
- D. Room Identification for Single-Occupancy Restrooms: Provide a 16 inch long by 6 inch tall room identification sign, including a pictogram of the International Symbol of Accessibility on a side. Text descriptor shall be “All Gender Restroom”. Characters, Braille, pictograms and mounting locations and height shall be in conformance to Article 2.03.

2.06 RAISED CHARACTER AND BRAILLE EXIT SIGNS

- A. Tactile Exit Sign Types:
1. “EXIT”.
 2. “EXIT ROUTE”.
 3. “TO EXIT”.
- B. Sign Requirements:
1. Finish and Contrast: Refer to paragraph 2.03.B.
 2. Raised Characters and Proportions: Refer to paragraph 2.03.A.

3. Braille: Refer to paragraph 2.03.C.
4. Mounting Location and Height: Refer to paragraph 2.03.F.

2.07 ASSISTIVE LISTENING DEVICE SIGN

- A. Include International Symbol of Access for Hearing Loss, CBC Figure 11B-703.7.2.4, with text “Assistive-Listening System Available”. Use upper and lower case characters. Sign shall comply with the following requirements:
 1. Finish and Contrast: Refer to paragraph 2.03.B.
 2. Character Height and Proportions: Refer to paragraph 2.03.B.
 3. Symbol of Accessibility: Refer to paragraph 2.03.E.

2.08 ACCESSIBILITY ENTRANCE SIGNS AND PATH OF TRAVEL DIRECTIONAL SIGNS

- A. Entrance Sign: Provide at each building entrance an International Symbol of Accessibility sign. Signs shall be visible to persons along approaching pedestrian ways.
- B. Directional Signs: Provide where indicated on the drawings with arrow indicators and International Symbol of Accessibility.
- C. Signs shall be mounted on wall with lower edge between 48 inches and 60 inches above ground surface or finish floor. Pole mounted, overhead and projecting signs shall have the lower edge at least 80 inches from the ground surface or finish floor.
- D. Sign shall comply with the following requirements.
 1. Directional Signs: Refer to paragraph 2.03.B.
 2. Symbol of Accessibility: Refer to paragraph 2.03.E.
- E. No Smoking Sign: Provide at each building entrance. Reverse cut white vinyl sign with 4 1/2-inch high no smoking symbol, mounted on glass entry doors. Under No Smoking symbol, place words “No Smoking”, ½ inch high minimum, San Serif upper and lower case characters.

2.09 PARKING SIGNS

- A. Tow-Away Sign: 18 inches by 24 inches with rounded corners. Black graphics on white background, with lettering not less than 1 inch high. Sign to read: “UNAUTHORIZED VEHICLES PARKED IN DESIGNATED ACCESSIBLE SPACES NOT DISPLAYING DISTINGUISHING PLACARDS OR SPECIAL LICENSE PLATES ISSUED FOR PERSONS WITH DISABILITIES WILL BE TOWED AWAY AT THE OWNER’S EXPENSE. TOWED VEHICLES MAY BE RECLAIMED AT DAVE’S TOWING, 890 W. LOS ANGELES AVE. SIMI VALLEY OR BY TELEPHONING (805) 526-4221“.

- B. Parking Space Identification Sign: 12-inch by 18-inch with rounded corners. White reflectorized graphic on dark blue background, and shall display an 8-inch high International Symbol of Accessibility per paragraph 2.03.E.
 - 1. Additional language or an additional sign below the International Symbol of Accessibility shall state I “Minimum Fine \$250”.
 - 2. Signs identifying van accessible parking spaces shall contain additional language or an additional sign with the designation “Van Accessible”.
- C. Signs shall be mounted on posts at head of each accessible parking with lower edge 80 inches minimum above ground surface, or mounted on walls at a minimum height of 60 inches from ground surface.

2.10 OCCUPANT LOAD SIGNS - NOT USED

- A. Provide maximum occupancy load signs. Post in a conspicuous place near the main exit or exit access doorway from the room or space of rooms and areas indicated in the drawings.
- B. Minimum size: 4 inches high by 8 inches wide, 7/8 inch high letters, 1 inch high numerals.
- C. Sign to read: “MAXIMUM OCCUPANCY LOAD XXX”. Indicate occupant load shown on drawings.

2.11 EMERGENCY GAS SHUT OFF SIGN

- A. Exterior Signs: Painted aluminum, suitable for outdoor use, with pre-drilled mounting holes.
 - 1. Sign Size: Minimum 4 inches high by 8 inches wide.
 - 2. Color: Subsurface white text, red background.
 - 3. Character Height: One inch high.
 - 4. Text:
 - a. Building gas shut-off valve(s): “BUILDING EMERGENCY GAS SHUT-OFF VALVE.”

2.12 FIRE SPRINKLER RISER ROOM SIGN

- A. Locate one sign at each fire sprinkler riser room door as indicated in drawings.
- B. Text: Sign to read “Fire Sprinkler Riser Inside”, white characters, 1 inch high on red background.
- C. Sign Requirements:

1. Raised Characters and Proportions: Refer to paragraph 2.03.B.
2. Braille: Refer to paragraph 2.03.C.
3. Mounting Location and Height: Mounted on the door, refer to paragraph 2.03.F.

2.14 EVACUATION PLANS

- A. 1/8 inch thick acrylic sign consisting of a floor plan depicting the building layout. The words "EVACUATION PLAN" shall be included at the top of the plan in minimum 3/4 inch high characters. Interior spaces shall be indicated by shading and corridor shall be prominent and displayed in white. Sign shall provide emergency procedures information and instructions to be followed in the event of an emergency, and shall be printed with a minimum of 3/16-inch high non-decorative lettering providing a sharp contrast to the background. Emergency procedures information shall include, but not be limited to the following:
 1. Viewer location symbol, "YOU ARE HERE" in the plan. Plan shall be oriented in each sign as required to correspond with the users view.
 2. Location of exits with arrows leading to them.
 3. Location of fire extinguishers.
 4. Fire department emergency telephone number 911.
- B. Mount signs so that bottom edge is no more than 48 inches from the finish floor, and within close proximity to the building, stair or elevator entrance. The reader must be able to approach the sign without encountering any obstacle.
- C. Evacuation Plans Requirements:
 1. Finish and Contrast: Refer to paragraph 2.03.B.
 2. Character Height and Proportions: Refer to paragraph 2.03.B.

2.15 CAST ALUMINUM LETTERS

- A. Sign, indicating building name, shall be furnished with cast aluminum letters as manufactured by Andco Industries Corp., or equal.
- B. Style: Helvetica Medium or Arial as selected.
- C. Material: 0.064 inch aluminum construction, unless indicated otherwise.
- D. Letter Size: Name shall be 12 inches high unless indicated otherwise.
- E. Letter Copy and Design: As indicated on Drawings.
- F. Finish: Finish shall be type H anodic clear or dark bronze, as selected by ARCHITECT.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Beginning of installation means installer accepts condition of existing surfaces.

3.02 METHODS OF INSTALLATION

- A. Interior Identification Signs and Interior Directional Signs:
 - 1. Fasten to wall with four tamper-proof round-head screws, one at each corner of sign. Furnish plastic anchors.
 - 2. When concealed installation is specified, install backplate to wall as above. Fasten sign to backplate with very high-bond double-faced tape.
 - 3. For installation on glass, fasten sign to glass with very high bond double faced tape. On opposite side of glass, anchor matching backplate to glass with very high-bond double-faced tape.
- B. Geometric Signs: Geometric toilet room signs shall be fastened to doors with three tamper-proof oval-head counter-sunk screws.
- C. Exterior Post Mounted Directional Signs: Size of required footing shall be as indicated on the drawings. Fasten sign with tamperproof stainless steel bolts.
- D. Exterior Wall Mounted Identification Signs and Directional Signs:
 - 1. Aluminum signs: Fasten to wall with 4 tamper-proof round-head screws, one at each corner of sign. Furnish plastic anchors.
 - a. Cement Plaster, Brick, or Masonry: Provide plastic anchors. For signs greater than 640 square inches use Leadwood Screw Anchors, concrete fasteners 1WSA 10112, or equal.
 - b. Chain Link Fence: Fasten with 9 gage hog rings, King Hughes Fasteners 5150DG50, or equal, with 11/16 inch opening at each corner of sign.
 - c. Wrought Iron Fence: Install at each corner with 3/16 inch stainless steel rivets.
 - 2. Acrylic signs: Install backplate to wall as indicated above. Fasten sign to backplate with high-bond double-faced tape and silicone.
- E. Cast Aluminum Letter Sign:
 - 1. Each letter shall be furnished with a minimum of three cast mounting lugs on backside, drilled and tapped to receive installation bolts.

2. Letters shall be installed as detailed. Letters shall be installed 1/2 inch away from wall surface, by an aluminum sleeve spacer.

3.03 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.04 PROTECTION

- A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 10 21 13
SOLID PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic toilet compartment partitions for following applications:
 - a. Toilet enclosures.
 - b. Sight screens.

B. Related Requirements:

1. Division 01 – General requirements.
2. Division 05 Section 05 4100 – Structural Metal Stud Framing for miscellaneous structural and support metal components required to secure compartments.
3. Division 10 Section 10 2813 – Toilet Accessories.

1.2 REFERENCES

A. ASTM International (ASTM):

1. ASTM A 240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
2. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
3. ASTM A 743/A 743M - Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.
4. ASTM B 86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings.
5. ASTM B 221 - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
6. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. International Code Council (ICC)/American National Standards Institute (ANSI):

1. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities, as applicable to toilet compartments designated as accessible.

C. United States Department of Justice:

1. ADA - Americans with Disabilities Act, Excerpt from 28 CFR Part 36 - ADA Standards for Accessible Design.

D. GREENGUARD Environmental Institute (GREENGUARD):

1. GREENGUARD certified low emitting products.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets for each type of product indicated. Include fabrication details, description of materials and finishes.
Product Test Reports: Submit manufacturer's certification that materials meet or exceed Specification requirements.
- B. Shop Drawings: Include overall product dimensions, floor plan, elevations, sections, details, and attachments to other work. Include choice of options with details.
- C. Samples for Selection: Furnish samples of manufacturer's full range of colors for initial selection.
- D. Samples for Verification: Furnish physical sample of material in selected color.
 1. Size: 2 by 2 inch (52 by 52 mm) minimum, in type of finish specified.
- E. Warranty: Sample of special warranty.
- F. Maintenance and cleaning instructions.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum 5 years' experience in the manufacture of toilet compartments. Manufacturers seeking approval must submit the following in accordance with Instructions to Bidders and Division 01 requirements:
 1. Product data, including test data from qualified independent testing agency indicating compliance with requirements.
 2. Samples of each component of product specified.
 3. List of successful installations of similar products available for evaluation by Architect.
- B. Installers Qualifications: Experienced Installer regularly engaged in installation of toilet compartments for minimum 3 years.
- C. Source Limitations: Obtain toilet compartment components and accessories from single manufacturer.

- D. Accessibility Requirements: Comply with requirements of ICC/ANSI 117.1, and with requirements of authorities having jurisdiction.
- E. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Not greater than 75.
 - 2. Smoke-Developed Index: 450.
- F. Indoor Environmental Quality Certification: Provide certificate indicated that products have been certified under the following programs, or a comparable certification acceptable to Owner:
 - 1. GREENGUARD Indoor Air Quality Certified.
 - 2. GREENGUARD Certified for Children and Schools.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver toilet compartments to site until building is enclosed and HVAC systems are in operation.
 - 1. Deliver toilet compartments in manufacturer's original packaging.
 - 2. Store in an upright condition.

1.6 WARRANTY

- A. Special Manufacturer's Warranty: Provide manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship during the following period after substantial completion:
 - 1. Plastic Toilet Partitions: Against corrosion, breakage, and delamination: 15 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products of Bradley Corporation, The Mills Company, Menomonee Falls, WI 53051.
 - 1. Contact Information: (800)272-3539, fax (262)251-5817; Email info@BradleyCorp.com; Website www.bradleycorp.com.
 - 2. Equal.

2.2 MATERIALS

- A. Plastic Panels: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent, and graffiti-resistant textured surface, Class B.
 - 1. Provide panels with minimum 30 percent pre-consumer recycled content.
- B. Zinc Aluminum Magnesium and Copper Alloy (Zamac): ASTM B 86.
- C. Stainless Steel Sheet: ASTM A 240 or A 666, 300 series.
- D. Stainless Steel Castings: ASTM A 743/A 743M.
- E. Aluminum: ASTM B 221.

2.3 PLASTIC TOILET COMPARTMENTS

- A. Toilet Compartment Type:
 - 1. Overhead braced.
 - a. Basis of Design Product: Bradley, Mills Partitions, Sentinel, Series 400.
- B. Door, Panel, and Pilaster Construction, General: HDPE, with a 3/16" (4.8mm) radiused edge.
 - 1. Provide exposed surfaces free of pitting, visible seams and fabrication marks, stains, or other imperfections.
 - 2. Provide aluminum heat sink at bottom edge of panels and doors.
 - 3. Provide no-sightline system.
- C. Door Construction: 1 inch (25 mm) thick.
- D. Panel Construction: 1 inch (25 mm) thick.
- E. Pilaster Construction: 1 inch (25 mm) thick.
- F. Headrail: Extruded anodized aluminum headrail with anti-grip profile. Clamps around pilaster and is secured to the wall with stainless steel brackets.
- G. Shoes: 4 inches (76 mm) high minimum, 300 series stainless steel with No. 4 satin brushed finish.
- H. Brackets (Fittings):
 - 1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.
- I. Plastic Panel Finish: Manufacturer's standard impregnated finish, with one color in each room.

1. Color: As selected by Architect from manufacturer's full range.

2.4 HARDWARE

- A. Hardware, Heavy Duty: Manufacturer's heavy-duty stainless steel, including stainless steel tamper-resistant fasteners:
 1. Hinges: Self-closing integral, nylon, gravity-type adjustable to hold doors open at any angle up to 90 degrees, with emergency access by lifting door.
 2. Latch and Keeper: Surface-mounted slide latch with flat rubber-faced combination door strike and keeper, with provision for emergency access, meeting requirements for accessibility at accessible compartments.
 3. Coat Hook: Combination hook and rubber-tipped stop, sized to prevent door from hitting compartment-mounted accessories. Provide wall bumper where door abuts wall. Provide formed L-shaped hook without stop at outswing doors. Mount with stainless steel through-bolts.
 4. Door Pull: Standard unit on outside of inswing doors. Provide pulls on both sides of outswing doors.

2.5 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanisms.
- B. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine work area to verify that measurements, substrates, supports, and environmental conditions are in accordance with manufacturer's requirements to allow installation.
 1. Proceed with installation once conditions meet manufacturer's requirements.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
- B. Install toilet partitions and screens in spaces with operating, temperature-controlled HVAC systems. Shield partitions and screens from direct sunlight.

- C. Clearances: Install with clearances indicated on Drawings. Where clearances are not indicated, allow maximum 1/2 inch (13 mm) between pilasters and panels, and 1 inch (25 mm) between panels and walls.
- D. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.
- E. Adjust and align door hardware to uniform clearance at vertical edges of doors.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 15 degrees from closed position when unlatched. Set hinges on out-swinging doors and doors in privacy screens to return doors to fully closed position.

3.4 FINAL CLEANING

- A. Remove packaging and construction debris and legally dispose of off-site.

Clean partition and screen surfaces with materials and cleansers in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 10 2813
TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Toilet accessories.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 3. Section 05 4100 - Structural Metal Stud Framing.
 - 4. Section 10 2113 - Plastic Toilet Compartments.

1.02 REGULATORY REQUIREMENTS

- A. Comply with CBC Chapter 11B requirements and ADAAG recommendations for accessibility.

1.03 SUBMITTALS

- A. Shop Drawings: Submit a schedule of accessories and Shop Drawings indicating installation methods and fasteners.

1.04 QUALITY ASSURANCE

- A. Coordinate related Work as required to ensure proper and adequate provision in framing of backing and wall finish for installation of accessories.
- B. Coordinate requirements of Section 10 2113 - Plastic Toilet Compartments to ensure that correct openings are provided in partitions for toilet accessories where required.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Protect accessories from damage.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Accessories shall be provided with necessary anchoring devices and fasteners appropriate for surfaces on which items are to be fastened.

2.02 MATERIALS

- A. Liquid Soap Dispenser: 20 gage stainless steel, 40-ounce. capacity, tamper-proof cap and concealed vandal-proof mounting. Continental V 444SS, ASI 0347, Bobrick B-2111, or equal.
- B. Toilet Paper Boxes:
2. All Restrooms:
 - a. Non-accessible toilet compartments: ASI 0264-1A2, Bobrick B-27460 (double roll tissue holder), Bradley, or equal.
 - b. Accessible toilet rooms or compartments: semi-recessed Bobrick B4388 or 3888, ASI 0031, Bradley 5412 (double roll tissue holder without paper roll spindle stops), or equal
- D. Grab Bars: 1-1/4 inches diameter by 18 gage stainless steel tubing, of size and configuration indicated. Ends shall be screwed to 11 gage stainless steel wall plate, with snaplock cover flanges. Grab bars over 36 inches in length shall be furnished with stainless steel support at mid point. Exposed stainless steel to be 180 grit satin finish. ASI 3700 series, Tubular Specialties Manufacturing, Inc. series Q-CS-1, Bobrick, or equal.
- E. Mirrors: Framed mirror, with one piece roll-formed 3/4 inch by 3/4 inch Type 304 stainless steel angle frame, with satin finish. Corners shall be heliarc welded, ground and polished smooth. Glass shall be No. 1 quality 1/4 inch float glass, electrolytically copper-plated. Frame shall be furnished with a continuous integral stiffener on sides. Back of mirror shall be protected by 1/8 inch thick, waterproof, shock-absorbing polyethylene padding and 20 gage galvanized steel back attached to frame with concealed screws. Mirror shall be provided with a 20 gage wall hanger. ASI 0600, Bobrick B-290 series, Bradley, or equal. Size as indicated on Drawings.
- F. Toilet Seat Cover Dispensers: Surface-mounted, Type 304 stainless steel, satin finish. ASI 0477SM, Bobrick B-221, Bradley, or equal.
- G. Sanitary Napkin Vendors and Disposals
1. Vendors: Surface mounted, Type 304 stainless steel, satin finish, tumbler lock, single 25 cent coin operation. ASI 0864, Bobrick B-2800, Bradley, napkin/tampon dispenser, or equal.
 2. Disposals in non-accessible toilet compartments Surface-mounted, Type 304 stainless steel, satin finish, ASI 0473-A, Bobrick B-270, Bradley, or equal.
 3. Disposals in accessible toilet rooms or compartments: recessed, semi-recessed or 3-inch maximum projection from wall surface; Bobrick B 353 (recessed), ASI 0473 (recessed), Bradley, or equal.

- H. Mop and Broom Holder Rack: Provide two 24-inch long minimum, stainless steel mop and broom holder racks at each janitor room. ASI 8215-3, Bobrick B223 by 24, Bradley, or equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Check openings in substrates to receive accessories. Verify openings are correctly located and sized to receive accessories, and that locations will comply with disability access requirements. Confirm that blocking, backing or support is properly located and adequate for the accessory installation.
- B. Verify spacing of plumbing fixtures and toilet partitions. Confirm spacing and locations are compatible with proposed accessory locations and will allow compliance with disability access requirements.

3.02 INSTALLATION

- A. Install toilet accessories in accordance with manufacturer's written recommendations and accessibility requirements. Fasten components firmly in place.
- B. Drill holes to correct size and application that is concealed by item with ¼ inch tolerance.
- C. Install recessed accessories into wall openings with sheet metal screws into metal frames.
- D. Install surface-mounted accessories to backing plates with machine screws, plumb, and aligned.
- E. Grab Bars:
1. Fasten to toilet partition with 3-inch diameter stainless steel back plates with studs, couplings, and stainless steel machine screws.
 2. At wood stud walls, fasten wood blocking with threaded stainless steel wood screws of sufficient length to penetrate blocking 1 ¼-inch minimum.
 3. At metal stud walls, provide 1/8 inch cold-rolled steel plate, drilled and tapped for machine screws, or 16 gage cold-rolled steel plate complete with threaded sleeves for stainless steel machine screws. Weld plates to studs.
 4. At concrete or masonry walls, install bars with sheet metal screws and expansion anchors.
 5. At plaster or gypsum board walls, provide spacers of same thickness as wall material to prevent crushing of wall material.

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- F. Mirrors: Install mirror on manufacturer supplied concealed wall hanger and fasten with two theft-resistant locking screws.
- H. Before Substantial Completion, deliver keys and maintenance instructions and product data to OWNER.

3.03 ADJUSTING AND CLEANUP

- A. Adjust accessories for proper operation.
- B. Remove rubbish, debris, and waste material and legally dispose of off the Project site.

3.04 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 10 4413

FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fire Extinguishers and Cabinets.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 05 4100 - Structural Metal Stud Framing.
3. Section 07 9200 - Joint Sealants.
4. Section 09 2216 - Non-Structural Metal Framing.
5. Section 09 2900 - Gypsum Board.

1.02 SUBMITTALS

A. Shop Drawings: Indicate materials, sizes, anchorage, and installation details.

B. Product Data: Submit manufacturer's product literature, indicating product characteristics.

C. Material Samples: Submit manufacturer's standard cabinet color Samples for selection by Architect.

1.03 QUALITY ASSURANCE

A. Installer shall be manufacturer trained and certified to install the Work of this section.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's wrapping to protect items.

B. Store items in a dry, enclosed area.

PART 2 - PRODUCTS

2.01 FIRE EXTINGUISHERS AND CABINETS

- A. Location: Fire extinguisher cabinets and fire extinguishers shall be installed where indicated on Drawings or as required by authorities having jurisdiction.
- B. Manufacturer: Fire extinguishers and cabinets shall be manufactured by one of the following:
1. Potter-Roemer.
 2. J. L. Industries.
 3. Larsen's Manufacturing.
 4. Modern Metal Products.
 5. Waltrous.
 6. Amerex (fire extinguishers).
 7. Equal.
- C. Fire Extinguisher Type: Provide a legally appropriate rechargeable fire extinguisher for every fire extinguisher cabinet and as otherwise indicated.
1. Classrooms, Corridors and Offices, Cabinet mounted:
 - a. Type ABC multi-purpose dry chemical with UL rating 2A:10B:C, 5 pound size, also with red glossy polyester coated steel cylinder, pressure gage, hose and horn. Maximum Height: 15 ¼-inch. Maximum Cylinder Diameter: 4 ½-inch.
 4. LAN Rooms, Bracket mounted:
 - a. Type Halotron 1, EPA approved "Clean Agent" with UL rating 5B:C, 5 pounds size, with red glossy polyester coated steel cylinder, discharge nozzle and bracket. Maximum Height: 15 ¼-inch. Maximum Cylinder Diameter: 6-inch. Provide 16 gage steel bracket by same manufacturer as extinguisher.
 5. Electrical, Boiler, Fan, Heating Rooms, bracket mount:
 - a. Type CO₂, carbon dioxide gas, with UL rating 5B:C. 10B:C, (5 pounds with red glossy polyester coated aluminum cylinder, hose and horn. Maximum Height, (not exceed): 17 ¾-inch. Maximum Cylinder Diameter, (not to exceed): 5 ¼-inch.
- D. Fire Extinguisher Requirements:
1. Design Specification:

- a. Finish: Corrosion and impact resistant red epoxy.
 - b. Valve Stem Assembly: Metal, reusable, connects to cylinder by threaded pipefitting, aluminum or steel siphon tube, and shatter resistant plastic face gage.
 - c. Gage (if applicable) to Indicate: "Recharge," "fully charged (195 PSI)," and "over charge."
 - d. Pull Pin: Metal, reusable and securely fastened to unit with metal, aluminum chain or very heavy plastic line approximately 4 ½-inch long.
 - e. Mechanical Operation: Pistol grip, heavy duty metal handle (plastic not permitted), and shall be operated by a grip and squeeze lever.
2. Manufacturer Identification/Information: Manufacturer's name, date manufactured, model number, U.L. approval seal and number, contents operating instructions, Fire Marshall approval, etcetera shall be identified on the Fire Extinguisher.
 3. Warning and First Aid Label: Fire extinguisher must indicate all standard warnings concerning breathing, eyes, skin and ingestion. Provide emergency and first aid procedures.
 4. Repair Parts: The manufacturer and/or their representative shall maintain within the Los Angeles Metropolitan Area an adequate stock of replacement parts, available for immediate delivery.
 5. Warranty:
 - a. Manufacturer shall provide a five year material warranty.
 - b. Installer shall provide a five year installation warranty.
 6. Material Safety Data Sheet: Provide an MSDS sheet with every shipment.
- E. Fire Extinguisher Cabinet: Potter-Roemer cabinets are listed as the standard of quality, products by other listed manufacturers are acceptable.
1. Semi-recessed cabinet: Provide semi-recessed, square trim edge cabinet with 1 1/4 inch to 2-inch projection:
 - a. Potter-Roemer Fire Extinguisher Cabinet 7022:
 - 1) Door Style: either DVL (Duo Vertical Panel with lock) or E (Center Break Glass with lock), glass to be clear tempered safety glass.

- 2) Cabinet Door and Frame: Cold rolled steel with electrostatically applied, thermally fused polyester coating with recoatable white finish.
- 3) Identification Lettering: Cabinet door to be furnished with die cut lettering indicating "FIRE EXTINGUISHERS" in contrasting color to cabinet finish, and either vertical or horizontal lettering depending upon door style.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation shall be in accordance with manufacturer's recommendations.
- B. Cabinets shall be installed plumb and level, where indicated on Drawings, at heights required by authorities having jurisdiction.

3.02 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.03 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

SECTION 12 2113

WINDOW BLINDS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Window vertical blinds and accessories.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings including plans, elevations, and fastening details.
- B. Product Data: Submit manufacturer's data and catalog cuts.
- C. Material Samples: Submit manufacturers color Samples and catalog cuts.

1.03 QUALITY ASSURANCE

- A. Qualifications of Manufacturer: Manufacturer shall have been regularly engaged in the business of manufacturing vertical blinds for five years.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Century Blinds Inc. Contract
- B. Hunter Douglas Contract.
- C. Levolor Contract.
- D. Equal

2.02 VERTICAL BLINDS

- A. Materials:
 - 1. Headrails shall be 6063-T5 aluminum alloy. Headrail shall have a high quality ivory baked enamel finish or clear anodized finish.
 - 2. Carriers shall be a 7/16" polyacetal plastic body and shall traverse on rolling self-lubricating plastic wheels aligned in channel runway. Carriers shall have a self-aligning mechanism designed to prevent damage to the vanes or carriers when over-rotated. Carrier stems shall be molded clear non-yellowing polycarbonate. Carriers shall be attached to each other with a nylon strap. Stem

of carriers shall be centered allowing headrail to be reversed. Spacing of vanes shall be 3 1/8" (for 3 1/2" vanes).

3. Rotation System shall be wand operated and use a lead carrier control unit. Traverse shall be controlled by a fiberglass wand attached to the lead control unit (also used for rotation).
4. Pinion (tilt rod) shall be four pronged 6063 T5 aluminum alloy.
5. Vanes shall be made of 100% PVC with UV inhibitors. Vane material shall meet NFPA-701 federal fire rating. 3 1/2" vanes shall be 22 gage.
6. Valance shall consist of a curved vane fitted into valance channel with square corners and continuous dust cover. Valance shall be attached to headrail using acetyl plastic clips.
7. Installation brackets shall be made of zinc plated steel. Headrail mounting clips shall be made of spring steel. Installation hardware shall facilitate easy installation and removal of headrail. Provide extension brackets where required by field conditions.
8. Blinds shall be manufactured in full compliance of ANSI/WCMA Standards.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that openings are ready to receive Work.
- B. Ensure that structural blocking and supports are installed and suitable for attachment and support of Work.

3.02 INSTALLATION

- A. Install blinds as detailed in locations indicated. Furnish and install necessary parts and perform adjustments required to provide a complete, rigid and properly operating installation. Corners and surfaces shall be free from burrs and sharp edges.
- B. Unless otherwise indicated, blinds shall be top-suspended, installed singly over each sash and between jambs or mullions, heads set flush with wall or trim, and shall not interfere with operation of sash or sash hardware. Where recessed installation is not indicated, blinds shall be installed over the casing, overlapping casings not less than 1 3/8-inch at sill, 1 3/4-inch at jambs and one inch at top.
- C. Brackets shall securely fasten head rails and shall provide for easy removal of head rails. Blinds shall be securely fastened by sheet metal screws through back into head rails at side channels.
- D. Brackets shall be fastened with galvanized or cadmium-plated pan-head all-purpose screws, oval-head wood screws, toggle bolts or appropriate fasteners.

3.03 INSTALLATION TOLERANCES

111001

- A. Maximum Variation of Gap at Perimeter: 1/4 inch.
- B. Maximum Offset from Level: 1/8 inch.

3.04 ADJUSTMENT AND CLEANUP

- A. Adjust for smooth operation.
- B. Before Substantial Completion, clean the blinds in accordance with manufacturer's recommendations.
- C. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.05 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 22 0500

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Basic Mechanical Requirements specifically applicable to Division 22 Sections, in addition to the general requirements.
- B. Plumbing work includes the following: furnish and install all piping and plumbing fixtures shown on the plumbing, mechanical, and architectural drawings described in these specifications. In connection with this work, contractor shall also furnish and install all necessary work, devices, hardware and systems required to make said systems properly and safely operable, including, but not limited to, support hardware, insulation, valves, flashing, cleanouts, cutting and patching.

1.2 WORK SEQUENCE

- A. Install work in phases to accommodate Owner's construction requirements. Refer to Architectural, Structural, and Electrical Drawings for the construction details and coordinate the work of this division with that of other divisions. Order the work of this division so that progress will harmonize with that of other divisions and all work will proceed expeditiously. During the construction period, coordinate mechanical schedule and operations with General Contractor and any other related subcontractor.
- B. Coordinate related work and modify surrounding work as required.

1.3 SUBMITTALS

- A. Submit on the following:
 - 1. All pipe, fittings, insulation, hangers and supports, labels, fixtures, adhesives and sealants, and equipment that is planned to be installed on this project.
- B. Proposed Products List: Include Products specified in the following Sections:
 - 1. Division 22 - Plumbing.
 - 2. Project Drawings.
- C. Submit product data grouped to include complete submittals of related systems, products, and accessories in a single submittal bound in a three ring binder with table of contents and section tabs. See General Conditions and other sections for additional submittal requirements. Submittals shall clearly identify electrical characteristics, options provided, color, model number and equipment tag as indicated on the drawings.

- D. Equipment and materials shall be ordered only after satisfactory review by Architect and Engineer.
- E. The following statement applies to all items reviewed: “Checking is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications. Contractor is responsible for dimensions which shall be confirmed at the job site; fabrication processes and techniques of construction; coordination of his work with that of other trades; and the satisfactory performance of his work.”
- F. Maintain a complete set of the most current reviewed submittal and shop drawings on site during construction.
- G. The first submittal shall be comprehensive and complete. Partial submittals will be returned without review.

1.4 REGULATORY REQUIREMENTS

- A. Conform to 2022 California Building Code.
- B. Fire Protection: Conform to 2022 California Fire Code, and California State Fire Marshall Regulations, Title 19, Public Safety.
- C. Plumbing: Conform to 2022 California Plumbing Code.
- D. Mechanical: Conform to 2022 California Mechanical Code.
- E. Electrical: Conform to 2022 California Electrical Code.
- F. Obtain approved inspections from authority having jurisdiction.
- G. Conflicts: Where conflict or variation exists amongst Codes, the most stringent shall govern.

1.5 PROJECT / SITE CONDITIONS

- A. Install work in locations shown on drawings, unless prevented by project conditions.
- B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other Sections. Obtain permission of Owner before proceeding.
- C. Piping Locations: Piping locations shown are diagrammatic only. Contractor shall verify locations of all lateral stubs, offsets, etc. required in the field. The actual locations of lines, cleanouts and connections may vary provided that complete systems are installed in compliance with codes.

- D. Construction Observation: In addition to the requirement for obtaining inspections by the local jurisdiction, Contractor shall notify Engineer and commissioning agent at appropriate times during the construction process so that they can visit site to become generally familiar with the progress and quality of Contractor's work and to determine if the work is proceeding in general accordance with the contract documents.
- E. Scaling of Drawings: In no case shall working dimensions be scaled from plans, sections, or details from the working drawings. If no dimension is shown on the architectural drawings, the prime Contractor shall request in writing that the Architect or the Engineer provide clarification or the specific dimension.

1.6 QUALITY ASSURANCE

- A. Qualification of Manufacturer: Products used in work shall be produced by manufacturers regularly engaged in the manufacture of similar items.
- B. Qualification of Installer: Use adequate number of skilled workmen, thoroughly trained and experienced in the necessary crafts, and completely familiar with the specified requirements contained in the plans and specifications.
- C. Applicable equipment and materials to be listed by Underwriters' Laboratories and manufactured in accordance with ASME, AWWA, or ANSI standards. Power-using equipment shall meet the California energy efficiency standards as defined in the current Title 24 requirements.
- D. Welding procedures and testing shall comply with ANSI Standard B31.1.0 standard code for pressure piping and the American Welding Society – Welding Handbook. Welding shall also comply with Division of the State Architect and structural plan requirements for materials, procedures, qualifications, and inspections.

1.7 DRAWINGS AND SPECIFICATIONS

- A. Drawings and specifications are intended to complement each other. Where a conflict exists between the requirements of the drawings and/or specifications, the contractor shall immediately and before commencing work, request clarification from Engineer.
- B. The Engineer shall interpret the drawings and the specifications, and the Engineer's decision as to the true intent and meaning thereof and the quality, quantity, and the sufficiency of the materials and workmanship furnished there under shall be accepted as final and conclusive.
- C. In case of conflicts not clarified prior to bidding deadline, use the most costly alternative (better quality, greater quantity, or larger size) in preparing the Bid. A clarification will be issued to the successful Bidder as soon as feasible after the Award, and if appropriate a deductive change order will be issued.
- D. All provisions shall be deemed mandatory except as expressly indicated as optional by the word "may" or "option".

- E. Examine and compare the contract drawings and specifications with the drawings and specifications of other trades. Report any discrepancies to the architect. Install and coordinate the work in cooperation with the other trades.

1.8 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Maintain uniformity of manufacturer for equipment used in similar applications and sizes.
- B. Provide products and materials that are new, clean, free from defects, damage, and corrosion.
- C. Provide name/data plates on major components with manufacturer's name, model number, serial number, date of manufacturer, capacity data, and electrical characteristics permanently attached in a conspicuous location on the equipment.
- D. Protect materials stored at site and installed from damage. Verify dimensions of equipment and fixtures prior to ordering. Install all equipment per the manufacturer's instructions for installing, connecting, and adjusting. A copy of the instructions shall be kept at the equipment during installation and provided to the engineer at his/her request.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install all equipment per the manufacturer's instructions for installing, connecting, and adjusting. A copy of the instructions shall be kept at the equipment during installation and provided to the engineer at his/her request.

- B. Adjust pipes, ducts, panels, equipment, etc., to accommodate the work to prevent interferences. Provide offsets as needed to avoid other trades.
1. Right-of-Way: Lines which pitch have the right-of-way over those which do not pitch. Lines whose elevations cannot change have right-of-way over lines whose elevations can be changed.
 2. Provide offsets, transitions, and changes in directions of pipes as required to maintain proper head room and pitch on sloping lines. Provide traps, air vents, drains, etc., as required. It is the intent of this paragraph that all cost associated with compliance be borne by the contractor.
 3. All equipment shall be firmly anchored to building structural elements per DSA approved plans.
 4. Carefully check space requirements with other trades and existing conditions to ensure material, fixtures or equipment can be installed in the spaces allotted. Coordination is required and essential.

3.2 FIRESTOPPING

- A. Firestop all penetrations of rated elements with approved firestop material such as Hilti FS-1 per manufacturer's plates. Provide plates to project inspector prior to installation.

3.3 ACCESS DOORS

- A. Doors and equipment shall be in close proximity for ease of use or service.

END OF SECTION

SECTION 22 0510

PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, notes, and general provisions of the Contract, including General and Supplemental Conditions, apply to this section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe and fittings for water, sewer, and vent.
 - 2. Escutcheons.

1.3 REFERENCES

- A. ANSI B31.9 - Building Service Piping.
- B. ASME B16.3 - Malleable Iron Threaded Fittings.
- C. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings.
- D. ASTM A47 - Ferritic Malleable Iron Castings.
- E. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- F. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- G. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.
- H. ASTM B32 - Solder Metal.
- I. ASTM B88 - Seamless Copper Water Tube.
- J. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- K. ASTM D1785 - Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- L. ASTM D2241 - Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR).
- M. ASTM D2466 - Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40.

- N. ASTM D2564 - Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings.
- O. ASTM D2855 - Making Solvent-Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings.
- P. ASTM D3034 - Poly Vinyl Chloride (PVC) Plastic Sewer Pipe SDR-35.
- Q. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
- R. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.
- S. ASTM D2513 - SDR11.5 Polyethylene Gas Pipe.
- T. ASTM D1784 – Low Extractable Polyvinyl Chloride for filtered water.

1.4 SUBMITTALS

- A. Product Data: For the following products:
 - 1. Piping and fittings.
 - 2. Escutcheons.
- B. Project Record Documents
 - 1. Submit the following:
 - 2. Record actual locations of valves and piping.
- C. Operation and Maintenance Data
 - 1. Submit the following:
 - 2. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.5 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with 2022 California plumbing code.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of the general requirements.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.

- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 - PRODUCTS

2.1 SANITARY WASTE AND VENT PIPING

- A. Within the building and out 5 feet
 1. Hub-less, cast-iron pipe and fittings: ASTM A888 or CISPI 301 of US manufacture.
 2. Standard shielded couplings, stainless steel: CISPI 310, NSF-certified.
 3. Heavy-duty couplings, stainless steel: ASTM C564. Use four-band clamps at all rainwater piping and sanitary waste piping greater than 2”.
 4. All cast-iron pipe and fittings and couplings shall be manufactured in the United States.
 5. Minimum slope 1/4” per foot to drain with no bellies in piping.
 6. All underground waste piping shall be installed per details on plumbing and structural drawings.
 7. All buried cast iron pipe shall be wrapped with 8-mil. polyethylene. Manufacturer and product shall be Northtown Polywrap installed per manufacturer’s recommended installation procedures.
- B. Past 5 feet from building
 1. PVC SDR 35 with waste fittings.
 2. Minimum slope 1/4” per foot to drain with no bellies in piping.
 3. All PVC waste piping shall be manufactured in the United States.
 4. Seton detectable warning tape

2.2 DOMESTIC WATER PIPING, ABOVE GROUND

- A. Hard Copper Tube: ASTM B88, Type ‘L’ water tube, drawn temper.
 1. Wrought-copper solder-joint fittings: ASME B16.22, wrought-copper pressure fittings, with lead-free solder.
 2. Bronze Flanges: ASME B16.24, class 150, with solder-joint ends.
 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

4. All pipe and fittings shall be made in the United States.

2.3 DOMESTIC WATER PIPING, BELOW GRADE

A. Under Building

1. Soft Copper Tube: ASTM B88, Type 'K' water tube, annealed temper.
2. Copper solder-joint fitting: ASME B16.22, wrought-copper pressure fittings. No joints under slabs.
3. Non lead bearing solder.
4. All pipe and fittings shall be made in the United States.
5. All underground copper piping shall be wrapped with poly encasement by Northtown Co.

B. Outside of Building (greater than five feet from footing)

1. PVC Schedule 80 with Schedule 80 solvent welded fittings; US made.
2. Tracer wire and Seton caution tape.

2.4 ESCUTCHEONS

A. Escutcheons for water, sewer, and vent piping penetrations of finished surfaces.

1. Manufacturers: subject to compliance with requirements, provide products by the following:
 - a. Brasscraft.
 - b. or equal
2. Description: chrome-plated cast brass with set screws.

2.5 SUPPLY TUBES

A. Supply tubes:

1. Manufacturers: subject to compliance with requirements, provide products by the following:
 - a. Brasscraft Speedi Plumb Plus.
2. Description: braided stainless steel with PVC inner hose, 1/2" FIP x 1/2" Comp.
3. IAMPO Listed.
4. Lead-free.

2.6 CLEANOUTS

A. Cleanouts for waste piping:

1. Manufacturers: subject to compliance with requirements, provide products by the following:
 - a. J.R. Smith
 - b. Zurn.

2. Description: cast-iron with threaded bronze plug. 18 gage stainless cover with vandal-proof screws for wall cleanout. Polished brass non-slip cover for floor cleanout. Concrete box for cleanout to grade with cast iron cover at non-traffic or non-surfaced areas and steel traffic rated cover at trafficketed areas with the words "building sewer cleanout" marked on cover.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.3 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.
- D. Install piping to conserve building 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 for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
- I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

- J. Provide support for utility meters in accordance with requirements of utility companies.
- K. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting.
- L. Seal all penetrations through exterior walls and fire rated walls with 3M Firestopping materials for fire rating capacity per the architectural plans and UBC requirements.
- M. Test all piping per 2022 California Plumbing Code Requirements.
- N. Underground Alert: Before laying out piping and performing trenching, contractor shall determine locations of existing underground utilities. Contact "Dig Alert / Underground Service Alert of Southern California" - 1-800-422-4133. Contractor shall also contact District's representative to ascertain locations of underground piping and other conditions affecting trenching, and shall perform testing and subsurface exploration as necessary to locate utilities. Do not perform trenching until all utilities have been located and marked.
- O. Trenching: Comply with the soils report for the project. If there is a conflict between these specifications and the soil report, follow the soils report requirements. Material shall be excavated from trenches and piled adjacent to the trench. Material shall be piled in such a manner that will cause a minimum of inconvenience to public travel. All rock, boulders, and stones shall be removed to provide a minimum clearance of six (6) inches under and around pipes. Excavations shall be kept free of water. Trenches shall be dug to true and smooth bottom grades and in accordance with the lines indicated on drawings and as directed. Trench widths shall not exceed 30 inches or 1.5 times outside diameter of the pipe plus 18 inches, whichever is greater. Minimum trench width shall be the outside diameter of pipe installed plus 12 inches. Depth of trenching for water and gas piping shall be such as to give a minimum cover of 18 inches over the top of the pipe. Deeper excavation may be required due to localized breaks in grade, or to install the new piping under existing culverts or other utilities where necessary. Trenching for sewers and drains shall be of sufficient width to permit proper jointing of the pipe and back filling of material along the sides of the pipe. Trench width at the surface of the ground shall be kept to the minimum amount necessary to install the pipe in a safe manner. Trenches shall be excavated below the barrel of the pipe a sufficient distance to provide for bedding material where the trench bottom is in a material which is unsuitable for foundation or which will make it difficult to obtain uniform bearing for the pipe. Such material shall be removed and a stable foundation provided. This shall include the preparation of the native trench bottom and/or top of the foundation material to a uniform grade so that the entire length of pipe rests firmly on a suitable, properly compacted material (sand and/or gravel required). Gravel to be used for foundation purposes shall be of a type and gradation to provide a solid compact bedding in the trench.
 - 1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support

pipe and conduit on an undisturbed subgrade.

2. For pipes and conduit 6 inches (150) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
3. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

Trench bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe. Excavate trenches 6 inches (150) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

- P. Backfill: Comply with the soils report for the project. If there is a conflict between these specifications and the soil report, follow the soils report requirements. Contractor shall complete 4" compacted sand bedding and then backfill to 6 inches over the top of the pipe with sand or gravel before starting backfilling operations. Take all precautions necessary to protect the pipe from damage, movement and shifting. Compaction equipment used above the pipe zone shall be of a type that does not injure the pipe. Where original excavated material is unsuitable for trench backfill, backfill gravel shall be placed. Unsuitable material shall be removed to the disposal area. Whenever a trench is excavated in a paved roadway, sidewalk or other area where minor settlements would be detrimental and where native excavated material is not suitable for compaction as backfill, trench shall be backfilled with backfill gravel. Warning tape markers and tracer wires shall be installed during backfill operations. When working in an existing traveled roadway, restoration and compaction shall be achieved as the trench is backfilled so as to maintain traffic. Provide temporary, traffic-bearing steel plates over excavations in public rights-of-way, if backfilling and re-paving cannot be accomplished before end of work period. Trench backfill under roadway shall be mechanically compacted to 95 percent of maximum density except for trenches over 8 feet in depth. In any trench in which 95 percent density cannot be achieved with existing backfill, the top 4 feet shall be replaced with backfill gravel mechanically compacted to 95 percent. The method of compaction shall be at contractor's option, unless excavation permit requires a specific type. Contractor shall be responsible to provide the proper size and type of compaction equipment and select the proper method of utilizing said equipment to attain the required compaction density. Compaction by water jetting will not be permitted. Where backfill is required to be certified, compliance shall be performed in accordance with the requirements of the governing authority. Allow testing service to inspect and approve each subgrade and fill layer before further fill, backfill or construction work is performed. Install warning tape at all underground piping.

See section below for special backfill requirements for buried cast iron piping.

- Q. Seal all penetrations through exterior walls and fire rated walls with 3M Firestopping materials for fire rating capacity per the architectural plans and CBC requirements.
- R. Test all piping per 2022 California Plumbing Code Requirements.
- S. Disinfect all water piping per AWWA requirements
 - 1. Acceptable Disinfectants
 - a. Sodium Hypochlorite
 - b. Calcium Hypochlorite.
 - 2. Flush system prior to disinfection. Add solution to bring system to 25 PPM for 24 hours. Neutralize solution prior to dumping to sewer.
 - 3. Testing Requirements for demonstration of compliance with the Maximum Containment Level (MCLs) of the Safe Drinking Water Act:
 - a. Total chlorine concentration of less than 1 mg/L (1 ppm).
 - b. The absence of any coliform bacteria.
 - c. Less than 200 non-coliform bacteria per 100 mL sample
 - 4. Repeat disinfection if test results are not satisfactory.
- T. Buried Cast Iron Piping. All buried cast iron pipe shall be double wrapped with 8-mil polyethylene (Polywrap), and provide backfill 6” minimum all a. round pipe using clean sand backfill, with testing performed by a corrosion engineering laboratory. The sand shall meet the following requirements:
 - 1. Minimum saturated resistivity of no less than 3,000 OHM-CM.
 - 2. pH between 6.0 and 8.0.
 - 3. Chloride content of less than 150 PPM.
 - 4. Sulfate content of less than 1,000 PPM.
 - 5. Ammonium concentration less than 10 PPM.
 - 6. Nitrate concentration less than 50 PPM.
- U. As-built locations of pipe with dimensions from easily identified building elements.

3.4 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.

- B. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- C. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.5 ERECTION TOLERANCES

- A. Establish invert elevations. Maintain gradients.
- B. Slope water piping and arrange to drain at low points.

END OF SECTION

SECTION 22 0523

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Bronze ball valves.
- 2. Bronze swing check valves.
- 3. Brass angle stops.
- 4. Hydrants.

B. Related Sections:

- 1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
- 2. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.

1.4.1 SUBMITTALS

- A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 2. ASME B31.1 for power piping valves.
 - 3. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 for valve materials for potable-water service.
- D. Lead-free construction per California requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set angle, gate, and globe valves closed to prevent rattling.
 - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
 - 5. Set butterfly valves closed or slightly open.
 - 6. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 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. 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. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

2.2 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. Conbraco Industries, Inc.; Apollo Valves.
 - b. NIBCO INC. S-685-80-LF to 2"; NIBCO T-FP-600A-LF > 2".
2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Sweat.
 - g. Seats: PTFE or TFE.
 - h. Stem: Bronze.
 - i. Ball: Chrome-plated brass.
 - j. Port: Full.

2.3 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. NIBCO INC.
 - b. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:

- a. Standard: MSS SP-80, Type 3.
- b. CWP Rating: 200 psig.
- c. Body Design: Horizontal flow.
- d. Body Material: ASTM B 62, bronze.
- e. Ends: Threaded.
- f. Disc: Bronze.
- g. Crispin Valve.
- h. DFT Inc.

2.4 BRASS ANGLE STOPS

A. Brass angle stops, heavy pattern.

- 1. Subject to compliance with requirements, provide products by the following:
 - a. Brasscraft.
 - b. Chicago Faucet.
- 2. Description: Lead-Free, heavy pattern, angle, ½” FIP inlet x ½” compression, loose key.

2.7 HYDRANTS

A. Hydrants

- 1. Manufacturer: subject to compliance with requirements, provide products by the following:
 - a. J.R. Smith.
 - b. Zurn.
 - c. Nibco.
 - d. Watts.
 - e. Woodford

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.

- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Anchor seismic valves to building per listing.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Domestic Water Shutoff Service: Ball valves.
 - 2. Throttling Service: Globe valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
 - 1. For Copper Tubing, 2" and Smaller: Soldered ends.
 - 2. For Copper Tubing, 2-1/2" to NPS 4". Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Steel Piping, 2-1/2" and Smaller: Threaded ends.
 - 4. For Steel Piping, 2-1/2" TO 4". Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 5. For Steel Piping, NPS 5 and Larger: Flanged ends.

END OF SECTION

SECTION 22 0529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following hangers and supports for plumbing 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.

1.3 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."

1.4 PERFORMANCE REQUIREMENTS

- A. Equipment supports shall be capable of supporting combined operating weight of supported equipment and connected systems and components.
- B. Not used.
- C. All exterior steel support components shall be hot-dipped galvanized. All welds shall be ground smooth and painted with three coats of zinc-rich paint.

1.5 SUBMITTALS

- A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Mechanical fastener systems.
4. Pipe positioning systems.
5. Trapeze pipe hangers. Include Product Data for components.
6. Metal framing systems. Include Product Data for components.
7. Pipe stands. Include Product Data for components.
8. Equipment supports.

B. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel." Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
4. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 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. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.
3. Unistrut
4. Superstrut

C. Galvanized, Metallic Coatings: Hot dipped.

D. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 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.

1. Manufacturers:

- a. B-Line Systems, Inc.; a division of Cooper Industries.
- b. Unistrut Corp.; Tyco International, Ltd.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. Power-Strut Div.; Tyco International, Ltd.
4. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated. Exterior components shall be hot-dipped galvanized.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

C. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

D. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

E. Provide submittal.

2.6 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated (interior use) Type 304 stainless steel (exterior use), for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

- B. Anchor must have ICC report. Provide report with submittal and one copy to the inspector. See State Architect Requirements for testing.

- 1. Manufacturers:

- a. Hilti, Inc.
- b. ITW Ramset/Red Head.
- c. Or equal.

- C. Pre-placed concrete inserts

- 1. Manufacturers:

- a. B-Line Systems, Inc.; a division of Cooper Industries.
- b. or equal.

2.7 PIPE STAND FABRICATION

- A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping. See plans for details.
- B. All exterior steel supports shall be hot dipped galvanized.
- C. No piping supports shall be mounted directly on roof membrane.

2.8 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.9 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized. All exterior steel supports shall be hot dipped galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT 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 piping that is subject to scratching.

3.2 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.
 - 1. 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.
 - 2. 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.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
 - 1. Install concrete inserts prior to concrete placement per manufacturer's listing.
 - 2. 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:
- G. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface.
- H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

- J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- K. Install lateral bracing with pipe hangers and supports to prevent swaying.
- L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- M. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.
- O. Insulated Piping: Comply with the following:
 - 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 according to ASME B31.9 for building services piping.
 - 2. 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.
 - 3. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - 4. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

- A. Provide 20 gauge sheet metal backing as needed to support equipment and fixture.

3.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports or 4x between framing with Simpson A-34 clips at each side, both ends..
- 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:
 - 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 contours of welded surfaces match adjacent contours.

3.5 ADJUSTING & PERSONNEL PROTECTION

- 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 1/2 inches below nut.
- C. Provide personnel protection at mechanical rooms, equipment areas and any equipment maintenance area from strut and threaded rods ends. Install soft protective materials to prevent skin and skull injuries. Install protection as soon as practicable after installation.

3.6 PAINTING

- A. Touch Up: Clean and touch up painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 22 4000

PLUMBING FIXTURES AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following plumbing fixtures, equipment, and related components:

1. Faucets for lavatories.
2. Flushometers
3. Toilet seats.
4. Protective shielding guards.
5. Fixture supports.
6. Water closets.
7. Lavatories.
8. Access doors.
9. Water hammer arrestors.
10. Drinking Fountain

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- C. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid- surface materials.
- D. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.
- E. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.
- F. FRP: Fiberglass-reinforced plastic.
- G. PMMA: Polymethyl methacrylate (acrylic) plastic.

224400

- H. PVC: Polyvinyl chloride plastic.
- I. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.4 SUBMITTALS

- A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.
- B. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.
- C. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- A. Accessible Plumbing Fixture Regulatory Requirements: Accessible plumbing fixtures shall comply with all of the requirements of 2022 CBC Chapter 11B.
- B. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
 - 1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in 2022 CEC, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.
- E. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- F. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

- H. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
 2. Vitreous-China Fixtures: ASME A112.19.2M.
 3. Water-Closet, Flushometer Tank Trim: ASSE 1037.
- I. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
1. Faucets: ASME A112.18.1.
 2. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
 3. NSF Potable-Water Materials: NSF 61.
 4. Pipe Threads: ASME B1.20.1.
 5. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
 6. Supply Fittings: ASME A112.18.1.
 7. Brass Waste Fittings: ASME A112.18.2.
- J. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
1. Brass Waste Fittings: ASME A112.18.2.
 2. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.
- K. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Flexible Water Connectors: ASME A112.18.6.
 2. Floor Drains: ASME A112.6.3.
 3. Hose-Coupling Threads: ASME B1.20.7.
 4. Hot-Water Dispensers: ASSE 1023 and UL 499.
 5. Off-Floor Fixture Supports: ASME A112.6.1M.
 6. Pipe Threads: ASME B1.20.1.
 7. Plastic Toilet Seats: ANSI Z124.5.
 8. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Faucet Cartridges and O-Rings: Provide two repair kits for each type faucet & flushometer except for the mop sink faucet.
 2. Flushometer Valve, Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than 2 of each type.

PART 2 - PRODUCTS

2.1 LAVATORY FAUCETS

A. Lavatory Faucets:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Zurn Battery Operated
 - b. Comply with California AB 1953 non lead requirements.
 - c. 4 inch on center, 0.5 GPM spray head, Thermostatic mixing valve with supply hoses.

2.2 FLUSHOMETERS

A. Flushometers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Zurn
2. Description: Flushometer for water-closet-type fixture & urinal. Include brass body with corrosion- resistant internal components, manual, 1.28 gallons per flush for toilets; 1/8 gallon per flush for urinals; control stop with check valve, vacuum breaker, brass tubing, and polished chrome-plated finish on exposed parts.

2.3 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Sanderson Plumbing Products, Inc.; Beneke Div.
2. Description: Extra heavy duty solid plastic.

2.4 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Truebro Shield for Lavatories

2.5 FIXTURE SUPPORTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Smith, Jay R. Mfg. Co.
2. Zurn Plumbing Products Group; Specification Drainage Operation.

B. Water-Closet Supports:

1. Description: Combination carrier designed for accessible or standard mounting height of wall- mounting, water-closet-type fixture. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space. Verify width of wall and submit support that fits in wall width.

2.6 WATER CLOSETS

A. Water Closets:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. American Standard Madera
2. Description: Floor mounting, vitreous-china fixture designed for flushometer valve operation.
 - a. Style: One piece.
 - 1). Bowl Type: Elongated with siphon-jet design.
 - 2). Design Consumption: 1.28 gal./flush (4.8 L/flush).

2.7 LAVATORIES

A. Lavatories:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. American Standard Lucerne
2. Description: vitreous-china fixture.
 - a. Type: Wall Mount
 - b. Faucet Hole Punching: 4-inch (102-mm) centers.
 - c. Color: White.

224400

- d. With strainers, tailpieces, traps and insulation.
- e. ADA Compliant

2.8 ACCESS DOORS

- A. Stainless steel, locking, fire-rated in rated assemblies.
- B. Manufacturers:
 - 1. J.R. Smith.
 - 2. Elmdor
 - 3. Zurn
- C. Access door schedule:
 - 1. Restroom shut-off valve – 14”x 14” minimum.
 - 2. Floor drain trap primer and water hammer arrestor – 14” x 16” minimum when combined, min. 12x12 when single.
 - 3. Install rated access panels at rated walls.

2.9 WATER HAMMER ARRESTORS

- A. Water Hammer Arrestors:

2.10 DRINKING FOUNTAIN & BOTTLE FILLER

- A. Elkay
 - 1. Model: VRCTL8WSK
 - a. Accessories: bottle filler model, cooler, vandal resistant, and outdoor application. Install filter in interior space avoid exposure to exterior and with a stainless steel panel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.
- B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
 - 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
 - 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
 - 3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.
- D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- E. Install wall-mounting fixtures with tubular waste piping attached to supports.
- F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.
- G. Install counter-mounting fixtures in and attached to casework.
- H. Install fixtures level and plumb according to roughing-in drawings.
- I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
 - 1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
- J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- L. Install flushometer valves for accessible water closets with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- M. Install toilet seats on water closets.
- N. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include

adapters if required.

- O. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.
- P. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- Q. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
- R. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."
- S. Set service basins in leveling bed of cement grout. Grout is specified in Division 22 Section "Common Work Results for Plumbing."
- T. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

3.4 FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

- E. Install fresh batteries in sensor-operated mechanisms.

3.5 ADJUSTING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.
- C. Replace washers and seals of leaking and dripping faucets and stops.
- D. Adjust sensor at toilets, urinals and lavatories for proper operation.

3.6 CLEANING

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
 1. Remove faucet spouts and strainers, remove sediment and debris, and re-install strainers and spouts.
 2. Remove sediment and debris from drains.
- B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 23 0500

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Basic Mechanical Requirements specifically applicable to Division 23 Sections, in addition to the General Requirements.
- B. Mechanical work includes the following: furnish and install all mechanical equipment shown on the mechanical, plumbing, architectural, electrical, and civil engineering drawings and described in these specifications. Contractor shall furnish and install, make operable, and test all mechanical equipment shown on the plans. In connection therewith, contractor shall also furnish and install all necessary work, devices, hardware and systems required to make said equipment properly and safely operable, including but not limited to, mounting hardware and framing, insulation, vibration control devices, duct systems, flashing, piping, valves, systems, energy management systems, cutting and patching.

1.2 WORK SEQUENCE

- A. Install work in phases to accommodate Owner's construction requirements. Refer to Architectural, Structural, Civil, and Electrical Drawings for the construction details and coordinate the work of this division with that of other divisions. Order the work of this division so that progress will harmonize with that of other divisions and all work will proceed expeditiously. During the construction period, coordinate mechanical schedule and operations with General Contractor and any other related subcontractor.

1.3 ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at the Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work as required.

1.4 SUBMITTALS

- A. Submit the following:
- B. Proposed Products List: Include Products specified in the following Sections:
 - 1. Section 23 - Mechanical.

2. Project Drawings

- C. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal. Submittals shall be specific to the fixtures/device/unit being submitted; the data shall be highlighted or marked to be quite clear as to the fixtures/devices/units that shall be provided.
- D. Equipment and materials shall be ordered only after satisfactory review by Owner and Engineer.
- E. The following statement applies to all items reviewed. "Checking is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications. Contractor is responsible for dimensions which shall be confirmed at the job site; fabrication processes and techniques of construction; coordination of his work with that of other trades; and the satisfactory performance of his work."
- F. Contractor shall clearly mark the submittal sheet as to which model number, size, color, etc. when there is more than one choice available.
- G. Maintain a complete set of the most current reviewed submittal and shop drawings on site during construction.
- H. Submittals shall have table of contents organized by specification section and shall clearly identify electrical characteristics, options provided, color, model number and equipment tag as indicated on the drawings.

1.5 REGULATORY REQUIREMENTS

- A. Conform to 2022 California Building Code.
- B. Fire Protection: Conform to 2022 California Fire Code, and California State Fire Marshall Regulations, Title 19, Public Safety.
- C. Plumbing: Conform to 2022 California Plumbing Code.
- D. Mechanical: Conform to 2022 California Mechanical Code.
- E. Electrical: Conform to 2022 California Electrical Code.
- F. Obtain approved inspections from authority having jurisdiction.
- G. Conflicts: Where conflict or variation exists amongst Codes, the most stringent shall govern.

1.6 PROJECT/SITE CONDITIONS

- A. Install work in locations shown on drawings, unless prevented by project conditions.
- B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other Sections. Obtain permission of owner before proceeding.
- C. Piping locations: Piping locations shown are diagrammatic only. Contractor shall verify locations of all lateral stubs, offsets, etc. required in the field. The actual locations of lines, cleanouts and connections may vary provided that complete systems are installed in compliance with codes. It is not the intent of the drawings to show necessary offsets required to avoid structure or other trades. It is the intent of this paragraph that all costs associated with this paragraph be borne by the contractor.
- D. Construction observation: In addition to the requirement for obtaining inspections by the local jurisdiction, contractor shall notify Engineer at appropriate times during the construction process so that Engineer can visit site to become generally familiar with the progress and quality of contractor's work and to determine if the work is proceeding in general accordance with the contract documents.
- E. Scaling of drawings: In no case shall working dimensions be scaled from plans, sections, or details from the working drawings. If no dimension is shown on the architectural drawings, the prime contractor shall request in writing that the architect or engineer provide clarification or the specific dimension.
- F. As equal: For an item to be substituted "as equal" the contractor must provide to the engineer a complete submittal no later than 7 days prior to the bid opening. Contractor shall be responsible for any cost associated with the change including architectural design, mechanical, structural and electrical engineering and changes in any element of the building.
- G. Unit and duct locations: Heating and air conditioning unit and duct locations shown are approximate only. Contractor shall verify locations of all structural members, other trades, and existing conditions in the field, and locate units and ductwork to avoid interference. All clearances required by unit manufacturer shall be maintained. Entire installation shall be in accordance with codes and the recommended installation procedures published by the manufacturers. It is not the intent of the drawings to show necessary offsets and transitions required to avoid structure or other trades. It is the intent of this paragraph that all costs associated with this paragraph be borne by the contractor.
- H. Contractor will verify with owner and site conditions the exact existing roofing system in place and provide compatible roofing materials and products. Contractor to provide written statement regarding existing roofing system and proposed roofing system and provide manufacturer information prior to procurement and installation.

- I. Proceed with roofing work only when existing and forecasted weather conditions will permit a unit of work to be installed in accordance with manufacturer's recommendations and warranty requirements.
- J. Flashings and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Complete flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

1.7 QUALITY ASSURANCE

- A. Qualification of Manufacturer: Products used in work shall be produced by manufacturers regularly engaged in the manufacture of similar items.
- B. Qualification of Installer: Use adequate number of skilled workman, thoroughly trained and experienced in the necessary crafts, and completely familiar with the specified requirements contained in the plans and specifications. Engage an experienced installer to perform work who has specialized in installing roofing similar to that required for this project; who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product; and who is eligible to receive the standard roofing manufacturer's warranty.
- C. Maintain uniformity of manufacturer for equipment used in similar applications and sizes.
- D. Provide products and materials that are new, clean, free from defects, damage, and corrosion.
- E. Provide name/data plates on major components with manufacturer's name, model number, serial number, date of manufacturer, capacity data, and electrical characteristics permanently attached in a conspicuous location on the equipment.
- F. Applicable equipment and materials to be listed by Underwriters' Laboratories and manufactured in accordance with ASME, AWWA, or ANSI standards. Power using equipment shall be meet the California energy efficiency standards as defined in the current Title 24 requirements.

1.8 DRAWINGS AND SPECIFICATIONS

- A. Drawings and specifications are intended to complement each other. Where a conflict exists between the requirements of the drawings and/or specifications, immediately and before commencing work, request clarification from Engineer.
- B. The Engineer shall interpret the drawings and the specifications, and the Engineer's decision as to the true intent and meaning thereof and the quality, quantity, and

sufficiency of the materials and workmanship furnished thereunder shall be accepted as final and conclusive.

- C. In case of conflicts not clarified prior to Bidding deadline, use the most costly alternative (better quality, greater quantity, or larger size) in preparing the Bid. A clarification will be issued to the successful Bidder as soon as feasible after the Award and if appropriate a deductive change order will be issued.
- D. All provisions shall be deemed mandatory except as expressly indicated as optional by the word "may" or "option".
- E. Examine and compare the contract drawings and specifications with the drawings and specifications of other trades. Report any discrepancies to the architect. Install and coordinate the work in cooperation with the other trades.

PART 2 – NOT USED

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install all equipment per the manufacturer's instructions for installing, connecting, and adjusting. A copy of the instructions shall be kept at the equipment during installation and provided to the engineer at his/her request.
- B. Adjust pipes, ducts, panels, equipment, etc., to accommodate the work to prevent interferences.
 - 1. Right-of-Way: Lines which pitch have the right-of-way over those which do not pitch. Lines whose elevations cannot change have right-of-way over lines whose elevations can be changed.
 - 2. Provide offsets, transitions, and changes in directions of pipes and ducts as required to maintain proper head room and pitch on sloping lines. Provide traps, air vents, drains, etc., as required.
- C. All equipment shall be firmly anchored to building structural elements.
- D. Install all equipment to permit proper service of equipment. Arrange pipes, ducts, conduits, etc to allow accessibility to equipment.
- E. Do not install equipment, pipes, or ducts above electrical room
- F. Install accessible plumbing fixtures at height shown on architectural drawings. Report any discrepancies or layout issues to Architect promptly.

3.2 COORDINATION OF WORK

- A. The contract documents establish scope, materials, and quality but are not detailed installation instructions. Drawings are diagrammatic.
- B. The contract documents show the general arrangement of equipment, ductwork, piping, and accessories. Provide offsets, fittings, and accessories which may be required but are not shown on the drawings. Investigate the site and review the other trades installation locations and requirements to determine conditions affecting the work and provide such work and accessories as may be required to accommodate such conditions.
- C. Whenever work interconnects with the work of other trades, coordinate to insure that all parties concerned have the necessary information required for a proper installation.
- D. Provide access doors as required to allow service and accessibility to valves, dampers, coils, etc. Install fire rated access doors in rated assemblies. Coordinate with framing and ceiling contractors.
- E. Furnish and set sleeves for passage of pipes, ducts, and conduits that pass through structural masonry and concrete walls, roofs, floors and elsewhere as required for the proper protection of each item passing through the building elements. See structural drawings for further details.
- F. Install UL Approved firestopping around all pipes, conduits, ducts, etc which pass through rated walls, partitions, and floors in strict accordance with manufacturer's listing and element rating.

3.3 OPERATING INSTRUCTIONS AND OPERATOR TRAINING

- A. Provide two copies of all operating and maintenance manuals to owner. Include parts lists and suppliers' names and phone numbers.
- B. Contractor shall provide an agent or a qualified party to program initial scheduling of the HVAC thermostat control system, (District to provide schedule in writing to said agent). Contractor shall provide to District representatives, 3 hours of training to ensure that the end user is properly trained in the required care, maintenance, and operations of the project. Specific training on the Web App to centrally manage all campus building's climate and schedules prior to close out. All training will be at an agreed upon date and time.

3.4 RECORD DRAWINGS

- A. Maintain on a daily basis at the project site a complete set of record drawings reflecting an accurate dimensional record of all deviations between work shown on the drawing and that actually installed.

230500

- B. Show any changes to specified equipment such as manufacturer, voltage, model number, capacity, etc. on record drawings.
- C. Provide two reproducible copies of the record drawing to the owner.

3.5 COMMISSIONING

- A. At the conclusion of the installation the contractor shall convene a pre-commissioning meeting to review the implementation of the commissioning process.
- B. Contractor shall verify that all building services, gas, electric, water, sewer, and information technologies are functional prior to beginning commissioning.
- C. Immediately correct roof leakage during construction. If the Contractor does not respond within twenty four (24) hours, the owner will exercise right to correct the Work under terms of the Construction of the Contract.
- D. The commissioning team shall comprise the general, mechanical, electrical, controls and plumbing contractors, the project manager, test and balance company, and the mechanical engineer. Provide sample forms for review to the mechanical engineer prior at pre-commissioning meeting.
- E. The commissioning process shall be including function testing all equipment, controls, natural gas, and electrical systems. All testing shall be documented in an item by item report with dates of test, test parameters and results.
- F. Provide commissioning report to project manager within two weeks of completion.

3.5 PATCHING

- A. Patching Materials, General: As required for original installation and to match surrounding construction.
 - 1. Contractor shall provide same products or types of construction as that in existing structure, as needed to patch, extend or match existing.
 - 2. Generally, the Contract Documents will not define products or standards of workmanship present in existing construction. Contractor shall determine products by inspection and necessary testing and determine quality of workmanship by using existing as a sample for comparison.
 - 3. The presence of a product, finish, or type of construction requires that patching, extending or matching shall be performed as necessary to make work complete and consistent with identical standards of quality.
- B. Patching of Building Finish Materials: Contractor shall match existing products and finishes. Contractor shall confirm colors, patterns, and textures with Architect/Owner. Contractor shall custom cut new materials to fit and to match joint patterns with

230500

existing materials. Contractor shall custom cut new materials to size to match existing constructions.

- C. Patching of Roof: Patching shall be performed by a licensed roofing contractor. Contractor shall patch and match existing adjacent surface. Where penetrations have occurred to finish surface to remain, contractor shall patch penetrations and repair. Restore exposed finishes of patch areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

END OF SECTION

SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following hangers and supports for HVAC system piping and equipment:
 - 1. Metal framing systems.
 - 2. Fastener systems.
 - 3. Equipment supports.
- B. Related Sections include the following:
 - 1. Division 23 Section(s) "Metal Ducts" for duct hangers and supports.

1.3 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."

1.4 PERFORMANCE REQUIREMENTS - NOT USED

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Strut and fittings.
 - 2. Fasteners.

1.6 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.2, "Structural Welding Code--Aluminum."
 - 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
 - 4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
 - 5. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. B-Line Systems, Inc.; A Division of Cooper Industries.
 - 2. ERICO/Michigan Hanger Co.
- C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Refrigerant Pipe Support: Provide EPDM clamp insert at all pipe clamps at refrigerant piping.

2.3 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.

2.4 METAL FRAMING SYSTEMS

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. B-Line Systems, Inc.; a division of Cooper Industries.
 2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
 3. Unistrut Corp.; Tyco International, Ltd.
- C. Coatings: At Interior - Manufacturer's standard finish – At exterior - Hot dipped galvanized.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 FASTENER SYSTEMS

- A. Mechanical-Expansion Anchors: Insert-wedge-type interior/exterior steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used. Install per ICC listing. Exterior anchors shall be stainless steel.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hilti, Inc.
- C. Wood Screws for secure pipe and duct supports to wood structure
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Simpson SDS Screws
 - b. or equal with self drilling feature and ICC report
- D. Sheet Metal Screws

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. TEK Screws
 - b. or equal with self drilling feature and ICC report

2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.7 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized. All exterior steel shall be hot dipped aluminized.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Use hangers and supports with hot dipped galvanized, at exterior locations.
- B. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system sections, install the following types:
 1. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- C. Use mechanical-expansion anchors where required in concrete construction.
- D. Provide neoprene isolators at refrigerant pipe support.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- C. 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.

- D. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- E. 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.
- F. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- G. All pipes and ducts shall be braced per 2008 SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems. Seismic hazard level is "A".

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Provide lateral bracing, to prevent swaying, for equipment supports.
- C. Anchor all equipment to resist seismic motion.

3.4 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.

3.5 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.

3.6 PAINTING

- A. Touch Up: 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. If material is galvanized spray with cold galvanizing.
 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

- B. 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.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply three coats of galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING(TAB) FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Balancing Air Systems:
 - a. Constant-volume air systems.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, Adjusting, and Balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 SUBMITTALS

- A. Certified TAB reports.
- B. Sample report forms.
- C. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.
 - 3. Application.
 - 4. Dates of use.

5. Dates of calibration.

1.5 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC, NEBB, or TABB.
 1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC, NEBB or TABB.
 2. TAB Technician: Employee of the TAB contractor and who is certified by AABC, NEBB or TABB as a TAB technician.
- B. TAB Conference: Meet with Engineer on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.
 1. Agenda Items:
 - a. The Contract Documents examination report.
 - b. The TAB plan.
 - c. Coordination and cooperation of trades and subcontractors.
 - d. Coordination of documentation and communication flow.
- C. Certify TAB field data reports and perform the following:
 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- D. TAB Report Forms: Use standard TAB contractor's forms approved by Engineer.
- E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

1.6 COORDINATION

- A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.
- B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible, and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

- L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures where applicable.
- B. Complete system-readiness checks and prepare reports. Verify the following:
 - 1. Permanent electrical-power wiring is complete.
 - 2. Hydronic systems are filled, clean, and free of air.
 - 3. Automatic temperature-control systems are operational.
 - 4. Equipment and duct access doors are securely closed.
 - 5. Balance, smoke, and fire dampers are open.
 - 6. Isolating and balancing valves are open and control valves are operational.
 - 7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - 8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111, NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", or SMACNA's "HVAC Systems – Testing, Adjusting, and Balancing" and in this Section.
 - 1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Division 23 Section "Air Duct Accessories."
 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 1. Measure total airflow.
 - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
 2. Measure fan static pressures as follows to determine actual static pressure:
 - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and –treating equipment.
 - a. Report the cleanliness status of filters and the time static pressures are measured.
 4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
 5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 6. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 23 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
 - 1. Measure airflow of submain and branch ducts.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 - 2. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
 - 3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure air outlets and inlets without making adjustments.
 - 1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Adjust using branch volume dampers rather than extractors and the dampers at air terminals.
 - 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 - 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 - 3. Manufacturer's name, model number, and serial number.
 - 4. Motor horsepower rating.
 - 5. Motor rpm.
 - 6. Efficiency rating.
 - 7. Nameplate and measured voltage, each phase.
 - 8. Nameplate and measured amperage, each phase.
 - 9. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove

proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.7 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.
4. Cooling-Water Flow Rate: Plus or minus 10 percent.

3.8 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: Prepare weekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.9 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
1. Pump curves.
 2. Fan curves.
 3. Manufacturers' test data.
 4. Field test reports prepared by system and equipment installers.
 5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
10. Report date.
11. Signature of TAB supervisor who certifies the report.
12. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
13. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
14. Nomenclature sheets for each item of equipment.
15. Data for terminal units, including manufacturer's name, type, size, and fittings.
16. Notes to explain why certain final data in the body of reports vary from indicated values.
17. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.

6. Balancing stations.
 7. Position of balancing devices.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches, and bore.
 - i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 3. Test Data (Indicated and Actual Values):
 - a. Total air flow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Filter static-pressure differential in inches wg.
 - f. Preheat-coil static-pressure differential in inches wg.
 - g. Cooling-coil static-pressure differential in inches wg.
 - h. Heating-coil static-pressure differential in inches wg.
 - i. Outdoor airflow in cfm.
 - j. Return airflow in cfm.
 - k. Outdoor-air damper position.

- l. Return-air damper position.
- m. Vortex damper position.

F. Apparatus-Coil Test Reports:

- 1. Coil Data:
 - a. System identification.
 - b. Location.
 - c. Coil type.
 - d. Number of rows.
 - e. Fin spacing in fins per inch o.c.
 - f. Make and model number.
 - g. Face area in sq. ft..
 - h. Tube size in NPS.
 - i. Tube and fin materials.
 - j. Circuiting arrangement.
- 2. Test Data (Indicated and Actual Values):
 - a. Air flow rate in cfm.
 - b. Average face velocity in fpm.
 - c. Air pressure drop in inches wg.
 - d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
 - e. Return-air, wet- and dry-bulb temperatures in deg F.
 - f. Entering-air, wet- and dry-bulb temperatures in deg F.
 - g. Leaving-air, wet- and dry-bulb temperatures in deg F.
 - h. Water flow rate in gpm.
 - i. Water pressure differential in feet of head or psig.
 - j. Entering-water temperature in deg F.
 - k. Leaving-water temperature in deg F.
 - l. Refrigerant expansion valve and refrigerant types.
 - m. Refrigerant suction pressure in psig.
 - n. Refrigerant suction temperature in deg F.
 - o. Inlet steam pressure in psig.

G. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

- 1. Unit Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.

- d. Model number and unit size.
- e. Manufacturer's serial number.
- f. Fuel type in input data.
- g. Output capacity in Btu/h.
- h. Ignition type.
- i. Burner-control types.
- j. Motor horsepower and rpm.
- k. Motor volts, phase, and hertz.
- l. Motor full-load amperage and service factor.
- m. Sheave make, size in inches, and bore.
- n. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Test Data (Indicated and Actual Values):

- a. Total air flow rate in cfm.
- b. Entering-air temperature in deg F.
- c. Leaving-air temperature in deg F.
- d. Air temperature differential in deg F.
- e. Entering-air static pressure in inches wg.
- f. Leaving-air static pressure in inches wg.
- g. Air static-pressure differential in inches wg.
- h. Low-fire fuel input in Btu/h.
- i. High-fire fuel input in Btu/h.
- j. Manifold pressure in psig.
- k. High-temperature-limit setting in deg F.
- l. Operating set point in Btu/h.
- m. Motor voltage at each connection.
- n. Motor amperage for each phase.
- o. Heating value of fuel in Btu/h.

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

- a. System identification.
- b. Location.
- c. Make and type.
- d. Model number and size.
- e. Manufacturer's serial number.
- f. Arrangement and class.
- g. Sheave make, size in inches, and bore.
- h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.

- I. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
 1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft..
 - g. Indicated air flow rate in cfm.
 - h. Indicated velocity in fpm.
 - i. Actual air flow rate in cfm.
 - j. Actual average velocity in fpm.
 - k. Barometric pressure in psig.

- J. Air-Terminal-Device Reports:
 1. Unit Data:
 - a. System and air-handling unit identification.
 - b. Location and zone.
 - c. Apparatus used for test.
 - d. Area served.
 - e. Make.

- f. Number from system diagram.
 - g. Type and model number.
 - h. Size.
 - i. Effective area in sq. ft..
2. Test Data (Indicated and Actual Values):
 - a. Air flow rate in cfm.
 - b. Air velocity in fpm.
 - c. Preliminary air flow rate as needed in cfm.
 - d. Preliminary velocity as needed in fpm.
 - e. Final air flow rate in cfm.
 - f. Final velocity in fpm.
 - g. Space temperature in deg F.
- K. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
1. Unit Data:
 - a. System and air-handling-unit identification.
 - b. Location and zone.
 - c. Room or riser served.
 - d. Coil make and size.
 - e. Flowmeter type.
 2. Test Data (Indicated and Actual Values):
 - a. Air flow rate in cfm.
 - b. Entering-water temperature in deg F.
 - c. Leaving-water temperature in deg F.
 - d. Water pressure drop in feet of head or psig.
 - e. Entering-air temperature in deg F.
 - f. Leaving-air temperature in deg F.
- M. Instrument Calibration Reports:
1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.10 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:
 - a. Measure airflow of at least 10 percent of air outlets.
 - b. Measure water flow of at least 5 percent of terminals.
 - c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
 - d. Verify that balancing devices are marked with final balance position.
 - e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Engineer.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Engineer.
3. Engineer shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make any adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract

Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 23 0700

HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Insulation Materials:
 - a. Flexible elastomeric.
 - b. Mineral fiber.
- 2. Adhesives.
- 3. Sealants.
- 4. Field-applied jackets.
- 5. Tapes.
- 6. Securements.

- B. Related Sections:

- 1. Division 22 Section "Plumbing Insulation."
- 2. Division 23 Section "Metal Ducts" for duct liners.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).
- B. Shop Drawings:
- C. Qualification Data: For qualified Installer.
- D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

- E. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 GLASS FIBER, FLEXIBLE

A. Manufacturers:

1. Johns Manville Microlite
2. Knauf PermaWick
3. Or equal.

B. Insulation: ASTM C553 C612; flexible, noncombustible blanket.

1. 'K' ('Ksi') value: ASTM C518, 0.29 at 75 degrees F (0.042 at 24 degrees C).
2. Maximum service temperature: 250 degrees F (121 degrees C).
3. Maximum moisture absorption: 0.20 percent by volume.

C. Vapor Barrier Jacket

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film
0.0032 inch (0.081 mm) vinyl.
2. Moisture vapor transmission: ASTM E96; 0.04 perm.
3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape

1. Manufacturers:
 - a. Polyken Model 236.
 - b. Or equal.

E. Tie Wire: Annealed steel, 16 gauge (1.5 mm).

2.2 GLASS FIBER DUCT LINER, FLEXIBLE

A. Manufacturers:

1. Certainteed Tough Guard R with ES.

- 2. Or equal.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. 'K' ('Ksi') value: ASTM C518, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum service temperature: 250 degrees F (121 degrees C).
- C. Adhesive
 - 1. Waterproof fire-retardant type
 - 2.. Manufacturers:
 - a. Kingco/Glenkote Seal-Flex Model 11-500.
 - b. Or equal.
- D. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
 - 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Keep insulation materials dry during application and finishing.
- F. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- G. Install insulation with least number of joints practical.

3.4 INSTALLATION

- A. Install materials in accordance with Manufacturer's instructions.
- B. Insulated ductwork conveying air below ambient temperature:
 - 1. Provide insulation with vapor barrier jackets.
 - 2. Finish with tape and vapor barrier jacket.
 - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- C. Insulated ductwork conveying air above ambient temperature:
 - 1. Provide with or without standard vapor barrier jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- D. External Duct Insulation Application:
 - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 - 2. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.

3. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
4. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

E. Exposed Spiral Duct and Plenum Liner Application:

1. Adhere insulation with adhesive for 100 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA Standards for spacing.
3. Seal and smooth joints.
4. Seal liner surface penetrations with adhesive.
5. Unless indicated otherwise on plans, duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for liner thickness.

3.5 TOLERANCE

- A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.6 FLEXIBLE GLASS FIBER DUCTWORK INSULATION SCHEDULE

DUCTWORK	THICKNESS Inch (mm)	FINISH
Outside Air Intake Ducts	2" (76.2)	Alum. Foil
Supply Ducts	2" (76.2)	Alum. Foil
Return Ducts	2" (76.2)	Alum. Foil
LINER	THICKNESS Inch (mm)	FINISH
Supply and Return Plenums	2" (76.2)	

END OF SECTION

SECTION 23 3113

METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Single-wall rectangular ducts and fittings.
 - 2. Single-wall round ducts and fittings.
 - 3. Sheet metal materials.
 - 4. Sealants and gaskets.
 - 5. Hangers and supports.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
 - 1. Seismic Hazard Level A: Seismic force to weight ratio, 0.48.
- B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2022.

1.4 SUBMITTALS

- A. Product Data: For each type of the following products:
 - 1. Ductwork materials
 - 2. Sealants and gaskets.
- B. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
 - 2. Suspended ceiling components.

3. Structural members to which duct will be attached.
4. Penetration of smoke barriers and fire-rated construction.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
 3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2022, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2022, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Lindab Inc.
 - b. McGill AirFlow LLC.
 - c. SEMCO Incorporated.
 - d. Sheet Metal Connectors, Inc.
 - e. Spiral Manufacturing Co., Inc.
 - f. Omni Duct Systems.

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 or G-90 at exterior.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.
3. Welded Connections.
4. Spiralmate connections.

C. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

D. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

E. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

F. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

G. Self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.4 SEISMIC-RESTRAINT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide a product by one of the following:
1. Cooper B-Line, Inc.; a division of Cooper Industries.
 2. Ductmate Industries, Inc.
 3. Hilti Corp.
 4. Mason Industries.
 5. Unistrut Corporation; Tyco International, Ltd.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round and flat-oval ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
 - 3. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 4. Conditioned Space, Return-Air Ducts: Seal Class C.

3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."
- B. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- C. Hangers Exposed to View: Threaded rod and angle or channel supports.
- D. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- E. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 SEISMIC-RESTRAINT-DEVICE INSTALLATION

- A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

233113

- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install cable restraints on ducts that are suspended with vibration isolators.

3.5 CONNECTIONS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

3.7 START UP

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.8 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

- B. Ducts:

- 1. Ducts Connected to Indoor Units:

- a. Pressure Class: Positive 2-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 12.

- C. Elbow Configuration:

- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

- a. Velocity 1000 fpm or Lower:

- 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.

- 2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

- a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

- 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
- b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam or Welded.

D. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees."
 - a. Velocity 1000 fpm or less 45-degree lateral.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:
 - a. Supply and Return Ducts with a Pressure Class Less Than 3-Inch wg: installed duct area for each designated pressure class. Leakage class – Rectangular 24, Round 12. Seal Class B
3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

- a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.10 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
- 3.. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.

233113

3.11 EXTERIOR DUCT COVERING

- A. At exterior duct locations install 22 ga. Standing seam duct cover per details in plans.
- B. Cover all openings to prevent bird access with ¼” galvanized mesh screen.

END OF SECTION

SECTION 23 3300

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Backdraft and pressure relief dampers.
 - 2. Manual volume dampers.
 - 3. Flange connectors.
 - 4. Turning vanes.
 - 5. Remote damper operators.
 - 6. Flexible connectors.
 - 7. Duct accessory hardware.
- B. Related Sections:
 - 1. Division 23 Section "Metal Ducts".

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60 (Z180) and G90 (Z275).
 - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and exposed ducts.
- D. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- F. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Air Balance Inc.; a division of Mestek, Inc.
 - 2. Duro Dyne Inc.
 - 3. Greenheck Fan Corporation.
 - 4. Nailor Industries Inc.
 - 5. Pottorff; a division of PCI Industries, Inc.
 - 6. Ruskin Company.
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: 2000 fpm (10 m/s).
- D. Maximum System Pressure: 1-inch wg (0.25 kPa).
- E. Frame: 0.052-inch- (1.3-mm-) thick, galvanized sheet steel.
- F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch (150-mm) width, 0.025-inch- (0.6-mm-) thick, roll-formed aluminum with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Felt.
- I. Blade Axles:

1. Material: Galvanized steel.
2. Diameter: 0.20 inch (5 mm).

J. Tie Bars and Brackets: Galvanized steel.

K. Return Spring: Adjustable tension.

L. Bearings: Steel ball or synthetic pivot bushings.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Screen Mounting: Front mounted in sleeve.
 - a. Sleeve Thickness: 20-gage (1.0-mm) minimum.
 - b. Sleeve Length: 6 inches (152 mm) minimum.
6. Screen Mounting: Rear mounted.
7. Screen Material: Galvanized steel.
8. Screen Type: Insect.
9. 90-degree stops.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance Inc.; a division of Mestek, Inc.
 - b. McGill AirFlow LLC.
 - c. METALAIRE, Inc.
 - d. Nailor Industries Inc.
 - e. Pottorff; a division of PCI Industries, Inc.
 - f. Ruskin Company.
2. Standard leakage rating.
3. Suitable for horizontal or vertical applications.
4. Frames:
 - a. Hat-shaped, galvanized-steel channels, 0.064-inch (1.62-mm) minimum thickness.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:
 - a. Single blade for ducts up to 24". Multiple blades for ducts greater than 24".
 - b. Opposed blade design for multiple blade dampers.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch (1.62 mm) thick.
6. Blade Axles: Galvanized steel.
7. Bearings:
 - a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Galvanized steel.
9. Where damper is not accessible install remote damper operator adjustment assembly.

2.4 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Ductmate Industries, Inc.
- B. Description: Add-on, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel for galvanized steel ducts.
- D. Material: Stainless steel for stainless steel ducts.
- E. Gauge and Shape: Match connecting ductwork.

2.5 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Ductmate Industries, Inc.
 2. Duro Dyne Inc.
 3. METALAIRE, Inc.
 4. SEMCO Incorporated.
 5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vaness and Vane Runners," and 2-4, "Vane Support in Elbows."
- D. Vane Construction: Single wall.
- E. Vane Construction: Single wall for ducts up to 48 inches (1200 mm) wide and double wall for larger dimensions.

2.6 REMOTE DAMPER OPERATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Pottorff; a division of PCI Industries, Inc.
 2. Young Regulator Company.
- B. Description: Cable system designed for remote manual damper adjustment.
- C. Tubing: Brass.
- D. Cable: Stainless steel.
- E. Wall-Box Mounting: Recessed, 2 inches (50 mm) deep.
- F. Wall-Box Cover-Plate Material: Steel.

2.7 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Ductmate Industries, Inc.
 2. Duro Dyne Inc.
 3. Ventfabrics, Inc.
 4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) wide attached to 2 strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick,

galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.

- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
 2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
 3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

- F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
 1. Minimum Weight: 24 oz./sq. yd. (810 g/sq. m).
 2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp and 440 lbf/inch (77 N/mm) in the filling.
 3. Service Temperature: Minus 50 to plus 250 deg F (Minus 45 to plus 121 deg C).

- G. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
 1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
 2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
 7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch (6-mm) movement at start and stop.

2.8 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and stainless-steel accessories in stainless-steel ducts.
- C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
 - 2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and smoke dampers in required locations according to UL listing.
- H. Connect ducts to duct silencers rigidly.
- I. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. On both sides of duct coils.
 - 2. Upstream from duct filters.
 - 3. At outdoor-air intakes and mixed-air plenums.
 - 4. At drain pans and seals.
 - 5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 - 6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 - 7. At each change in direction and at maximum 50-foot (15-m) spacing.
 - 8. Upstream from turning vanes.
 - 9. Upstream or downstream from duct silencers.
 - 10. Control devices requiring inspection.

11. Elsewhere as indicated.

J. Install access doors with swing against duct static pressure.

K. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
5. Body Access: 25 by 14 inches (635 by 355 mm).
6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).

L. Label access doors according to Division 22 Section "Identification for Plumbing Piping and Equipment" to indicate the purpose of access door.

M. Install flexible connectors to connect ducts to equipment.

N. For fans developing static pressures of 5-inch wg (1250 Pa) and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION

SECTION 23 3416 - CENTRIFUGAL
HVAC FANS AND EXHAUST SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Exhaust Fans.

1.2 RELATED WORK

A. Section 23 31 13 - Metal Ducts.

B. Section 23 33 00 - Ductwork Accessories: Backdraft dampers.

1.3 REFERENCES

A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.

B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

C. AMCA 99 - Standards Handbook.

D. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes

E. AMCA 300 - Test Code for Sound Rating Air Moving Devices.

F. AMCA 301 - Method of Calculating Fan Sound Ratings from Laboratory Test Data.

G. NEMA MG1 - Motors and Generators.

H. NFPA 70 - National Electrical Code.

I. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point clearly plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions.

1.5 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division 01.
- B. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 1.
- B. Protect motors, shafts, and bearings from weather and construction dust.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not operate fans for any purpose until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. See equipment schedule on plans.

2.2 GENERAL

- A. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.
- B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.
- C. Fabrication: Conform to AMCA 99.
- D. Performance Base: Sea level conditions.
- E. Temperature Limit: Maximum 600 degrees F (315 degrees C).
- F. Static and Dynamic Balance: Eliminate vibration or noise transmission to occupied areas.

2.3 FANS

- A. Manufacturer. Subject to the requirements of the specifications, provide one of the following:

233416

1. Panasonic

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with Manufacturer's instructions.
- B. Install flexible connections specified in Section 23 33 00 between fan inlet and discharge ductwork. Ensure metal bands of connectors are parallel with minimum one inch (25 mm) flex between ductwork and fan while running.
- C. Provide backdraft dampers at inlet of environmental exhaust fans and as indicated.

3.2 SCHEDULE

- A. See EQUIPMENT SCHEDULE on plans.

END OF SECTION

SECTION 23 3713

DIFFUSERS, REGISTERS, GRILLES, AND LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Rectangular and square wall registers.
- 2. Round Ceiling Diffusers.
- 3. Louvers.

B. Related Sections:

- 1. Division 23 Section "Air Duct Accessories" for volume-control dampers not integral to diffusers, registers, and grilles.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

- 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
- 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

C. Samples for Verification: For louvers to verify color selected.

D. Source quality-control reports.

PART 2 - PRODUCTS – SEE SCHEDULE ON PLANS

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 26 0000

GENERAL PROVISIONS

PART 1 - GENERAL

- A. The general contract provisions apply to this section and take precedent over this section in case of conflict.

1.01 GENERAL PROVISIONS

- A. This division supplements the applicable requirements of other divisions.

1.02 DEFINITIONS

- A. For the purposes of Division 260000, the following definitions apply:
 - 1. Provide: Furnish and install.
 - 2. Indicated: As shown on the drawings or specified herein.
 - 3. Circuit Designation: Panel designation and circuit number, i.e., LA-13.
 - 4. Approved equal: Approved by the engineer of record as equal in his sole determination.

1.03 SCOPE OF WORK

- A. The Specifications for Work of Division 260000 include, but are not limited to the following sections:

- 26 0000–General Provisions
- 26 0050–Basic Electrical Materials and Methods
- 26 0060–Minor Electrical Demolition for Remodeling
- 26 0111–Conduits
- 26 0120–Conductors
- 26 0130–Electrical Boxes
- 26 0133–Terminal Cabinets
- 26 0140–Wiring Devices
- 26 0142–Nameplates and Warning Signs
- 26 0164–Branch Circuit Panelboards
- 26 0190–Support Devices
- 26 2450–Grounding
- 26 2510–Lighting Fixtures
- 26 4721–Fire Alarm and Detection System
- 26 4745–Networking & Data Communications
- 26 4750–Cabling and Distribution System

26 4901–General Control Devices

26 4920–Motor Control

- B. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this division, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Examine all divisions for related work required to be included as work under this division.
 - 2. General provisions for electrical work.
 - 3. Site observation including existing conditions.

- C. Related Work Specified Elsewhere but included in the scope of work:
 - 1. Motors and their installation.
 - 2. Control wiring and conduit for heating, ventilating and air conditioning.

- D. Work Not In Contract (N.I.C.):
 - 1. Telephone instruments.

- E. Coordination
 - 1. The following supplements are additional General Requirements pertaining to work of this Division. Provisions of Division 1 - General Requirements shall remain in effect.
 - a. Coordinate work of various sections of Division 26 and 27.
 - b. Coordinate work of this Division 26 with work of Divisions 2 through 25.

1.04 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI).
- B. Association of Edison Illuminating Companies (AEIC).

- C. Electrical Testing Laboratories (ETL).
- D. Illuminating Engineering Society (IES).
- E. Institute of Electrical and Electronic Engineers (IEEE).
- F. Insulated Cable Engineers Association (ICEA).
- G. National Electrical Manufacturers Association (NEMA).
- H. National Fire Protection Association (NFPA).
- I. Underwriters Laboratories, Inc. (UL).
- J. California State Fire Marshal (CSFM).
- K. California Energy Commission (CEC) Title 24.

1.05 QUALITY ASSURANCE

- A. Regulations: All the electrical equipment and materials, including their installations, shall conform to the following applicable latest codes and standards:
 - 1. California Electric Code, Latest Adopted Edition (CEC)
 - 2. Local and State Fire Marshal.
 - 3. Occupational Safety and Health Act (OSHA).
 - 4. Requirements of the Serving Utility Company.
 - 5. State Codes Amendments.
 - 6. Requirements of the Office of the California State Architect (OSA).
 - 7. California Administrative Code, Title 8, Chapter 4, Industrial Safety Orders.
 - 8. California Administrative Code, Title 24.
 - 9. County of Ventura Codes and Regulations.
- B. Variances: In instances where two or more codes are at variance, the most restrictive requirement shall apply. In instances where plans and specifications are at variance or conflict the most restrictive requirement shall apply.

Contractor shall be responsible for all his associated work and materials and also the work and materials of related or affected trades.

- C. Contractor's Expense: Obtain and pay for all required bonds, insurance, licenses, and pay for all taxes, fees and utility charges required for the electrical work.
- D. Testing and Adjustment:
 - 1. Perform all necessary tests required to ascertain that the electrical system has been properly installed, that the power supply to each item of equipment is correct, and that the system is free of grounds, ground faults, and open circuits, that all motors are rotating in the proper directions, and such other tests and adjustments as may be required for the proper completion and operation of the electrical system. Contractor shall provide a copy of all test reports to prove these tests have been performed.
 - 2. If, during the course of testing, it is found that system imbalance is in excess of 20%, rearrange single-pole branch circuit in lighting and receptacle panels to bring system balance to within 20% on all phases. Record all such changes on the typewritten panelboard schedule and submit a summary of changes to the Engineer on the record drawings.

1.06 SUBMITTALS

- A. Procedure: In accord with the Submittal Section.
- B. Shop drawings: Detailed shop drawings for the following equipment:
 - 1. Branch circuit panelboards.
 - 2. Circuit breaker.
 - 3. Fire alarm system.
 - 4. Contactors and cabinet.
 - 5. Low voltage cabling riser diagram
- C. Product data: Detailed manufacturer's data for:
 - 1. Disconnects.
 - 2. Lighting fixtures and associated equipment including control.
 - 3. Low voltage cabling systems.

- D. Test results for the following:
 - 1. Fire alarm system.
 - 2. Cables.
- E. Include sufficient information to indicate complete compliance with Contract Documents. Include illustrations, catalog cuts, installation instructions, drawings, and certifications. On each sheet show manufacturer's name or trademark.
- F. Operating, maintenance, and instruction data for:
 - 1. Fire Alarm and detection.
 - 2. Audio equipment.
- G. Instruction materials:
 - 1. Provide at the time of personnel instruction period three bound copies of instruction manuals for the systems as listed in Subparagraph 1.04.A.4.f.
 - 2. Include the following (minimum) information in each copy of instruction manual:
 - a. Manufacturers' names and addresses including phone numbers.
 - b. Serial numbers of items furnished.
 - c. Catalog cuts, exploded views and brochures, complete with technical and performance data for all equipment, marked to indicate actual items furnished and intended use.
 - d. Recommended spare parts.

1.07 OWNER'S PERSONNEL INSTRUCTIONS

- A. Prior to completion of the contract, and at the Owner's convenience, instruct verbally and demonstrate to the Owner's personnel, the operation of the systems as listed under operating, maintenance, and instructional data and/or emergency generator, automatic transfer switch and fire alarm annunciator panel.

1.08 CLEANING

- A. Clean exterior surfaces and interiors of equipment and remove all dirt, cement, plaster and other debris. Protect interior of equipment from dirt during construction and clean thoroughly before energizing.

- B. Clean out cracks, corners and surfaces on equipment to be painted. Remove grease and oil spots so that paint may be applied without further preparation.

1.09 PROJECT RECORD DOCUMENTS - Prepare the following and submit to the engineer before final acceptance:

- A. Mark Project Record Documents daily to indicate all changes made in the field.
 - 1. In addition to general requirements of Project Record Drawings, indicate on drawings, changes of equipment locations and ratings, trip sizes, and settings on circuit breakers, alterations in raceway runs and sizes, changes in wire sizes, circuit designations, installation details, one-line diagrams, control diagrams and schedules.
- B. Use green to indicate deletions and red to indicate additions.
 - 1. Use the same symbols and follow the same drafting procedures used on the Contract Drawings.
- C. Locate dimensionally off of contract drawings all underground conduit stubbed-out for future use, underground feeder conduits, and feeder pull box locations using building lines by indicating on the Project Record Drawings.
- D. At the completion of underground conduit installation provide underground conduit record documents to owner's representative.
- E. Two copies, in binder form, of all test results as required by these specifications - 260030.
- F. Two copies of local and/or state code enforcing authorities final inspection certificates.
- G. Two copies, in binder form, of electrical equipment cut sheets, manufacturer's installation instructions, warranty certificates, and product literature for all products utilized on project.

1.10 SERVICE INTERRUPTIONS AND UTILITY

- A. Coordinate with the Owner the interruption of services necessary to accomplish the work.
- B. Coordinate with the utility company all work associated with power and communications distribution systems and service entrance equipment.
- C. Electrical contractor shall supply temporary power for all trades.

1.11 MINIMUM SPECIFICATION REQUIREMENTS (ALL WORK OF DIVISION 260000)

- A. As a minimum Specification requirement, all materials and methods shall comply with applicable governing codes.

1.12 PENETRATION SEALING 

- A. Seal penetration through exterior walls and fire rated walls, floors, ceilings, and roofs with 3M Firestopping materials of fire rating capacity rated per architectural plans and UBC or prevailing building code requirements.

1.13 PLACING EQUIPMENT IN SERVICE

- A. Do not energize or place electrical equipment in service until all interested parties have been duly notified and are present or have waived their rights to be present. Where equipment to be placed in service involves service or connection from another contractor of the owner, notify the owner in writing when the equipment will be ready for final testing/connection and schedule to the owner's satisfaction of this service connection. Notify the owner two weeks in advance of the date the various items of equipment will be complete.

1.14 OWNER-FURNISHED ITEMS

- A. Pick up Owner-furnished items and handle, deliver, install, and make all final connections.
 - 1. Assume responsibility for the items when consigned at the storage facility or in the field in accord with requirements of the Contract Documents.

1.15 ELECTRIC ITEM LOCATION

- A. Electrical drawings are generally diagrammatic. Verify equipment sizes with shop drawings and manufacturers' data and coordinate location layout with other trades. Notify owner and engineer of any changes of location requirements prior to installation and obtain engineer's written acceptance for all changes/revisions.

1.16 DEMOLITION

- A. Scope: Provide and perform demolition, preparatory and miscellaneous work as indicated and specified, complete.
- B. Principle Items of Work:

1. Demolition and removal of existing electrical conduit, wiring and equipment required to complete the project.
 2. Preparation of the existing building to receive or connect the new work.
 3. Miscellaneous demolition, cutting, alteration, and repair work in and around the existing building necessary for the completion of the entire project.
 4. Disconnecting and reconnection of electrical equipment as required by the construction modifications.
- C. Existing Conditions: Make a detailed survey of the existing conditions pertaining to the work. Check the locations of all existing structures, equipment and wiring (branch circuiting and controls). Provide at bid time any exclusions for existing conditions work.
- D. Salvage and Disposal: All removed material other than items to be reused shall be returned to the owner or disposed of in accordance with instructions from the owner's representative. Disposal shall be done in accordance with EPA and governing body requirements and regulations. Contractor shall pay all fees and charges for disposal.

1.17 ELECTRICAL WORKMANSHIP REQUIREMENTS

- A. It is required that all electrical construction of this Contract be performed by journeyman electricians. All journeyman electricians shall have a minimum of 4 years of apprenticeship training and hold a valid Certificate of Completion from an apprenticeship training course approved by the State of California Department of Industrial Relations, Division of Apprenticeship Standards. This is intended to mean that a person who does not hold a valid Certificate of Completion from an apprenticeship training course approved by the State of California Department of Industrial Relations, Division of Apprenticeship Standards will not be permitted to do electrical work of any kind that involves new construction, nor make repairs, alterations, additions, or changes of any kind to any existing system of electrical wiring, apparatus, equipment, light, heat, or power.
- B. Contractor may employ electrical helpers or apprentices on any job of electrical construction, new or existing, when the work of such helpers or apprentices is performed under direct and constant personal supervision of a journeyman electrician holding a valid Certificate of Completion from an apprenticeship training course approved by the State of California Department of Industrial Relations, Division of Apprenticeship Standards.

1. Each journeyman electrician will be permitted to be responsible for quality of workmanship for a maximum of eight helpers or apprentices during any same time period, provided the nature of work is such that good supervision can be maintained and quality of workmanship achieved is the best, as expected by Owner and as implied by the latest edition of the California Electrical Code (National Electrical Code with State of California amendments).
 2. Before each journeyman electrician commences work, deliver to Owner at project site a photocopy of journeyman's valid Certificate of Completion from an apprenticeship training course approved by the State of California Department of Industrial Relations, Division of Apprenticeship Standards.
- C. All electrical systems shall be installed in a neat and workmanlike manner per National Electrical Code requirements and ANSI approved NEIS National Electrical Installation Standards.

1.18 DESIGN CHANGES AFTER AWARD OF BID

- A. When a change in the quantity or size of conductors is made, the conduit size will remain in accordance with that indicated in the original contract drawings rather than the drawing symbol conduit table. When code permits, provide conductor insulation 'THWN' where required to maintain conduit fill conformance with the National Electrical Code.

1.19 MATERIAL AND EQUIPMENT SUBSTITUTION

- A. Where two or more trade names or manufacturers are mentioned, selection shall be made from the group listed for use in the base bid. The order in which names are listed is not intended to be any indication of preference.
- B. Where a single manufacturer, product or trade name is stated, that manufacturer, product or trade name shall be used in the base bid. The use of other manufacturers, products or trade names will be considered by the engineer of record (unless that product is indicated for no substitution) only if submitted as alternate items at the time of bidding, with evidence of equality and a statement of net price difference as compared to the specified item. After approval by the engineer of record, the architect and owner reserve the right to review such submittals and to determine the acceptability for use.
- C. Equipment other than that specified will be accepted only when written approval is given by the engineer of record and architect, in accordance with Division 1.

- D. The contractor shall be held responsible for all physical changes in piping, equipment, etc. resulting from equipment substitution and likewise bear any increased cost of other trades in making said substitution. Approval by the architect of equipment other than that specified does not relieve this contractor of this responsibility.

1.20 REQUESTS FOR INFORMATION

- A. The contractor shall submit all requests for information (RFI's) typewritten on the attached form.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

SECTION 26 0050
BASIC ELECTRICAL MATERIALS & METHODS

PART 1 - GENERAL

- 1.01 DESCRIPTION: Division 1 applies to this Section. This Section contains general requirements for the Sections in Division 26.
- A. Related Work Not in Division 26: Refer to individual Division 26 Sections.
- 1.02 QUALITY ASSURANCE:
- A. Codes: Entire installation shall comply with requirements of authorities having jurisdiction.
- B. Permits: Contractor shall pay for all permits required by work under this Division.
- C. Inspections: Contractor shall arrange for all inspections and correct non-complying installations.
- 1.03 SUBMITTALS: Refer to Division 1 for procedures.
- A. Material and Equipment: Prior to start of work, 6 copies of a list of all materials and equipment covered by Division 26 shall be submitted for approval. Contractor shall allow ample time for checking and processing and shall assume responsibility for delays incurred due to rejected items. No installation of material concerned shall be made until such written approval has been obtained. Approval of materials and equipment shall in no way obviate compliance with the Contract Documents. Each item proposed shall be referenced to the applicable Section, Page, and Paragraph of Division 26. For each item proposed, give name of manufacturer, trade name, catalog data, and performance data.
- B. Equipment Layout Drawings: Submit "Equipment Layout Drawings" for each equipment room or area containing equipment items furnished under this Division. Layout Drawings shall consist of plan view of room, to scale, showing projected outlines of all equipment, complete with dotted line indication of all required clearances including all those needed for removal or service. Location of all conduit and pull boxes shall be indicated.
- C. Service Manuals: Refer to Submittal Section. Indexed Service Manuals shall be submitted which shall include test reports, service instructions, and renewal parts lists of all equipment.
1. Submission and Information: Service Manuals shall be submitted for approval at least 30 days before final inspection. The following information together with any pertinent data, shall be included in Service Manual:
- a. Renewal part numbers of all replaceable items.
- b. Manufacturer's cuts and rating data.

- c. Serial numbers of all principal pieces of equipment.
 - d. Supplier's name, address, and phone number.
- 2. Copies: Four (4) copies of approved Service Manual shall be delivered on or before date required.
- D. Record Drawings: Prepare and submit in accordance with requirements. Contractor shall make notations, neat and legible, daily as the work proceeds. Drawings shall be available for inspection at all times and kept at the job site. All buried conduit and/or indicated future connections outside any building shall be located both by depth and by accurate measurement from a permanently established landmark such as a building or structure.
- E. Seismic Calculation: Refer to Article 3.01 herein.
- F. Spare Parts: Conform to the Submittal Section. Deliver following spare parts to Owner and obtain receipts. Submit at same time as Operating Instructions:
 - 1. Spare fuses; 1 set for each combination fuse breaker.
 - 2. Spare pilot light lamps of each type used on project, in quantity of 10%, but not less than 2%.
 - 3. Overload heater elements; 2 sets for each size used on project.
- G. Special Tools: If any part of the equipment furnished under Division 26 requires a special tool for assembly, adjustment, resetting, or maintenance thereof and such tool is not readily available on the commercial tool market, it shall be furnished with the equipment as a standard accessory and delivered to the Owner.
- H. Maintenance Paint: One (1) can of touch-up paint shall be delivered to Owner for each different color factory finish which is to be the final finished surfaces of the product.

1.04 DRAWINGS:

- A. Diagrammatic Drawings: For purposes of clarity and legibility, drawings are essentially diagrammatic although size and location of equipment is drawn to scale wherever possible, Contractor shall make use of data in all the Contract Documents and verify information at building site.
- B. Routing of Conduit and Piping: The drawings indicate required size and termination of conduits and raceways. It is not intent to indicate all necessary offsets and it shall be the responsibility under this Division to install conduit in such a manner as to conform to structure, avoid obstructions, preserve headroom, keep openings and passageways clear, and make all equipment requiring inspection, maintenance and repair accessible without extra cost to the Owner.
- C. Coordination with Other Trades: Check with other Divisions of the Specifications so that no interference shall occur and in order that elevations may be established for the work. Installed work which interferes with the work of other trades shall be removed and rerouted at the discretion of the Architect.

1.05 DAMAGE AND REPAIRS:

- A. Emergency Repairs: Owner reserves the right to make temporary repairs as necessary to keep equipment in operating condition without voiding Contractor's warranty or relieving Contractor of his responsibility during warranty period.
- B. Responsibility for Damage: Contractor shall be responsible for damage to grounds, buildings, or equipment due to work furnished or installed under this Division 26.

1.06 PROTECTION, CARE, AND CLEANING:

- A. Protection: Provide adequate protection for finished parts of materials and equipment against physical damage from any cause during progress of work and until final completion. Sensitive electrical equipment shall not be installed until major construction is completed.
- B. Care: During entire construction, properly cap all lines and equipment to prevent entrance of sand and dirt. Protect equipment against moisture, plaster, cement, paint or work of other trades by covering with polyethylene sheets.
- C. Cleaning: After installation is completed, clean all systems as follows in addition to requirements specified:
 - 1. Field Painted Items: Clean exterior of conduits, raceways, piping and equipment exposed in completed structure; removing all rust, plaster, cement and dirt by wire brushing. Remove grease oil and similar materials by wiping with clean rags and suitable solvents.
 - 2. Factory Finished Items: Remove grease and oil on all factory finished items such as cabinets and controllers, and leave surfaces clean and polished.
- D. Connection: Prior to energizing, check all electrical connection hardware and torque where necessary.

PART 2 - PRODUCTS

- 2.01 PRODUCTS: Products and materials shall be as specified in the pertinent Sections of Division 26.
- 2.02 MATERIALS AND EQUIPMENT: Wherever possible, all materials and equipment used in installation of this work shall be of same manufacturer throughout for each class of material or equipment. Materials shall be new and bear UL label, wherever subject to such approval. Comply with ANSI, IEEE and NEMA standards, where applicable.

PART 3 - EXECUTION

- 3.01 SEISMIC REQUIREMENTS: Electrical equipment for emergency systems shall be braced to withstand the lateral forces that result from earthquakes. Under Work of Division 26, submit seismic calculations stamped and signed by a

registered California structural engineer confirming size, number, and location of required anchoring hardware. Electrical equipment vendors shall furnish weights together with dimensions and the center of gravity location for all emergency electrical equipment for this purpose.

- 3.02 GENERAL LATERAL BRACING REQUIREMENTS: As shown on Drawings. Additional bracing requirements shall conform to specific requirements shown on Drawings or in other Sections of Division 26. Anchorages for equipment subject to thermal expansion and movement shall conform to manufacturer's recommendation and intent of general bracing requirements. When general and specific bracing requirements enumerated above are in conflict with referenced standards, the most stringent requirements shall govern.
- 3.03 EXCAVATION AND BACKFILL: Perform all excavation and back fill required to install Work of Division 26, both inside and outside. Perform all excavation and backfilling in accordance with Division 2.
- A. Excavation: Bury conduits outside building to a depth of not less than 24" (or as required by Code) below finish grade, unless noted otherwise.
 - B. Backfilling: Do not backfill until after final inspection and approval of conduit installation by all legally constituted authorities and recording of the buried items on the Record Drawings.
- 3.04 CUTTING AND PATCHING:
- A. Cutting of Existing Structural Work: Holes in existing slabs and concrete walls shall be cored to the minimum size required. The Contractor shall submit Drawings showing dimensioned sizes and locations for all such holes to Architect for approval before cutting. Where required for conduit installation, slabs on grade shall be saw-cut to minimum required width; submit cutting Drawings to the Architect for approval before cutting.
 - B. Patching: Holes or chases shall be patched to match adjacent surfaces.
- 3.05 CONCRETE WORK: Concrete construction required for the Work of Division 26 shall be provided under the Work of Division 26.
- 3.06 PAINTING: Finish painting of electrical equipment will be as specified in Division 9, unless equipment is herein specified to be furnished with factory applied finish coats. Equipment to be field painted shall be furnished with a factory applied prime coat.
- A. Touch-Up: If factory finish on any equipment furnished under Division 26 is damaged in shipment or during construction of building, the equipment shall be refinished by Contractor to satisfaction of Architect.
 - B. Concealed Equipment: Uncoated cast-iron or steel that will be concealed, or will not be accessible when installations are completed, shall be given one heavy coat of black asphaltum before installation.
- 3.07 OPERATING INSTRUCTIONS: Contractor to provide services of an experienced Engineer to instruct Owner in operation of entire installation.

MOORPARK COLLEGE

ALTERATION TO STUDENT SERVICES ANNEX (A#33484) NEXT-UP

VENTURA COUNTY COMMUNITY COLLEGE DISTRICT

BASIC ELECTRICAL MATERIALS & METHODS

26 0050-4

Instructional period shall be during normal work day hours. This instruction period may be simultaneous with compliance tests.

3.08 COMPLIANCE TESTS: Conduct such tests of all portions of installation as may be necessary to ensure full compliance with the Drawings and Specifications. Tests shall be made in the presence of the Owner. Costs of test shall be borne by Contractor and Contractor shall provide all instruments, equipment, labor and materials to complete all the tests. Tests may be required on any item between installation of Work and the end of 1 year warranty period. Should these tests develop any defective materials, poor workmanship or variance with requirements of Specifications, Contractor shall make any changes necessary and remedy any defects at his expense.

A. All Feeders: Measure and record as follows:

1. 600 volt conductors shall be tested with 500 volt megger to ground on each phase. megger to be on test for one minute before any readings are taken. The minimum values on all feeders shall be 100,000 OHMS.
2. Copies of the certified test readings shall be transmitted to Owner.

3.09 SYSTEM ACCEPTANCE:

A. Final Review: The Contractor shall request a final review prior to system acceptance after:

1. Completion of installation of all systems required under the Contract Documents.
2. Submission and acceptance of operating and maintenance data.
3. Completion of identification program.

B. Acceptance: Is contingent on:

1. Completion of final review and correction of all deficiencies.
2. Satisfactory completion of acceptance tests demonstrating compliance with all performance and technical requirements of Contract Documents.
3. Satisfactory completion of training program and submission of manuals and Drawings required by Contract Documents.

3.10 PRELIMINARY OPERATION: The Owner reserves the right to operate portions of the electrical system on a preliminary basis without voiding the warranty or relieving the Contractor of his responsibilities.

3.11 CLEAN-UP: Conform to the Submittal Section. Upon completion and at other times during progress or Work, when required, remove all surplus materials, rubbish, and debris resulting from Work of Division 26.

END OF SECTION

SECTION 26 0060

MINOR ELECTRICAL DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as shown on Drawings.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Owner and Architect/Engineer before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Disconnect and make safe all electrical systems in walls, floors, and ceilings scheduled for removal.
- B. Coordinate utility service outages with Utility Company and Owner's representative.
- C. Provide temporary wiring and connections to maintain required existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and

connections. Obtain permission from Owner at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area when outage affects business operation.

- E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Notify Owner and local fire service at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.
- F. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service and new system is accepted. Disable system only to make switchovers and connections. Notify Owner and Telephone Utility Company at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.
- G. Existing Security System: Maintain existing system in service until new system is complete and ready for service and new system is accepted. Disable system only to make switchovers and connections. Obtain permission from the Owner and security company at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Demolish and extend existing electrical work under provisions of this Section.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring to source of supply and re-label devices as spares.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
- F. Disconnect and remove abandoned panelboards and distribution equipment.
- G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

- H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- I. Disconnect and remove abandoned conduit.
- J. Repair adjacent construction and finishes damaged during demolition and extension work.
- K. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
- L. Extend existing installations using materials and methods compatible with existing electrical installations, and in compliance with new project specifications.
- M. Modify existing as-built drawings to note changes.

3.04 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment which remain or are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- C. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts, and broken electrical parts.

3.05 INSTALLATION

- A. Install relocated materials and as required by this section and Owner's representative.

END OF SECTION

SECTION 26 0111

CONDUITS

PART 1 - GENERAL

- A. The general provisions apply to this section.

1.01 WORK INCLUDED

- A. Conduits; including:
 - 1. Rigid steel conduit.
 - 2. Intermediate metal conduit (IMC).
 - 3. Electrical metallic tubing (EMT).
 - 4. Rigid aluminum conduit.
 - 5. Polyvinyl chloride conduit (PVC).
 - 6. Flexible metal conduit.
 - 7. Liquid-tight flexible metal conduit.

1.02 DEFINITION

- A. Conduit: This term shall be construed to mean conduit and conduit fittings; and tubing and tubing fittings.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Support material: Section 260190.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION - ALL MATERIALS SHALL BE MANUFACTURED IN THE USA.

- A. Rigid Steel Conduit: Hot-dipped galvanized or sherardized including the threads, manufactured in accordance with ANSI C80.1 and UL6.
 - 1. Threaded, hot-dipped galvanized or sherardized fittings manufactured in accordance with ANSI C80.4.

- B. Intermediate Metal Conduit: Hot-dipped galvanized including the threads, manufactured in accordance with UL 1242.
- C. Electrical Metallic Tubing: Manufactured in accordance with ANSI C80.3 and UL 797.
 - 1. Provide compression fittings in walls, ceiling spaces or exposed construction areas.
 - 2. Provide compression (water tight) fittings in damp areas or areas exposed to weather.
- D. Rigid Aluminum Conduit: Manufactured in accordance with ANSI C80.5.
 - 1. Threaded fittings, manufactured in accordance with ANSI C80.4.
- E. Polyvinyl Chloride Conduit: Schedule 40 and schedule 80, manufactured in accordance with ANSI C33.91, UL 651, and Nema TC-2.
 - 1. Cemented type fittings of the same manufacturer as the conduit.
- F. Polyvinyl Chloride Conduit: Type EB, heavy wall, manufactured in accordance with ANSI C33.91, UL651, and Nema TC-8.
 - 1. Cemented fittings of the same manufacturer as the conduit.
- G. Flexible Metal Conduit: Hot-dipped galvanized steel, manufacturer in accordance with UL 1.
 - 1. Squeeze type, malleable iron, cadmium plated, straight and angle connectors for all sizes and twist-in connectors for 1/2-inch and 3/4-inch flexible metal conduit.
- H. Liquid-Tight Flexible Conduit: Hot-dipped galvanized with liquid-tight vinyl jacket.
 - 1. Liquid-tight fittings.

PART 3 - EXECUTION

3.01 USE

- A. EMT for all exposed and concealed work except as indicated in Paragraphs B, C, D, E, F, and G.
- B. Rigid steel, IMC, or rigid aluminum conduit in areas where exposed conduit could be subject to physical damage or where conduit is exposed and conductor phase to ground voltage exceeds 300 volts.

- C. Rigid aluminum conduit may be used for all feeder runs exposed or concealed in stud walls and spaces above suspended ceilings.
- D. PVC Conduit:
 - 1. Schedule 40 for runs below grade in direct contact with earth.
 - 2. Schedule 40 in concrete floors, walls or roofs.
- E. Flexible Conduit (steel only permitted):
 - 1. For connection to equipment subject to vibration, maximum length 18 inches. In wet locations use liquid-tight flexible conduit.
 - 2. For connection to lighting fixtures above suspended ceilings. Lengths limited to 72 inches.
 - 3. Install ground conductors in all flexible conduits.
- F. Where 3/4-inch conduit runs are concealed in walls or ceilings and these runs are through wood studs and wood joists, flexible steel conduit may be used up to a maximum length of 6'0".
- G. All risers shall be PVC coated RGS with bushings.
- H. In concrete or below grade use conduit not smaller than 1 inch. Maximum size in concrete slab: 1 inch. Run larger sizes under slab.
- I. Use long sweep elbows with minimum radius 10 times nominal conduit diameter for all telephone and communication runs.

3.02 INSTALLATION

- A. Provide conduit support and bracing in accordance with the latest published SMACNA guidelines.
- B. Perform excavating, trenching, backfilling, and compacting as specified in Division 2.
- C. Minimum cover for runs below finished grade outside buildings: 24 inches except where noted or required by the serving utility. Minimum cover for conduit in concrete floors, walls or roof: 1/3 thickness of slab. Minimum cover under building slabs is 12-inches.
- D. Minimum separation from uninsulated hot water pipes, steam pipes, heater flues or vents: 6 inches. Avoid running conduit directly under water lines.

- E. Protect inside of conduit from dirt and rubbish during construction by capping all openings with plastic caps intended for the purpose.
- F. Provide conduit bodies for exposed conduit runs at junctions, bends or offsets where required. Do not use elbows or bends around outside corners of beams, walls or equipment. Make conduit body covers accessible.
- G. Make conduit field cuts square with saw and ream out to full size. Shoulder conduits in couplings.
- H. Run a minimum of one 3/4-inch empty conduit for every three single pole spare circuit breakers, spaces or fraction thereof and not less than two 3/4-inch conduits from every flush mounted panel to an accessible space above the ceiling and below the floor.
- I. Make conduit projections from covered areas to areas exposed to the weather watertight by proper flashing. Extend flashing a minimum of 6 inches in all directions from conduit.
- J. Where conduit is to remain empty, install polypropylene or nylon pull-line 3/16" minimum diameter from end to end with tag at each end designating opposite terminations.
- K. Run conduit parallel and at right angle to building lines, when visible in finished construction.
- L. Cap conduits indicated to be stubbed-out underground using glued-on PVC caps intended for this purpose.
- M. Install a coupling flush with the floor on all conduits stubbed up through floors on grade.
- N. Make no bends with a radius less than 12 times the diameter of the cable it contains nor more than 90 degrees. Make field bends with tools designed for conduit bending. Heating of metallic conduit to facilitate bending is not permitted.
- O. Where conduit installed in concrete or masonry extends across building construction joints, provide expansion fittings as manufactured by O.Z.; Crouse-Hinds; Appleton; or equal, with approved ground straps and clamps.
- P. Concrete Wall or Slab Penetrations: All core drilling, sleeves, blockouts or other penetrations must be approved by the Structural Engineer prior to installation.
 - 1. Space sleeves and core drills to insure a minimum dimension of 3 times the nominal trade diameter of the largest adjacent conduit between sleeves or core drills.
 - 2. Use blockouts for concentrations of conduits in a confined area.

- Q. Do not penetrate walls with flexible conduit where subject to physical damage. Use recessed box with extension ring for transition from interior to exterior of wall.
- R. All homeruns shown shall be run to the panel indicated independently of all other homeruns. Provide pull points so as not to exceed total bends of 360 degrees between them unless otherwise indicated.
- S. At switchboards, manholes and floor standing distribution panelboards, provide insulated throat bushings or bell ends on all non-metallic conduit entries and bushings on all metallic conduit entries.
- T. Provide bushings on all conduit terminations sized 1" and larger.
- U. Provide weatherproof boxes and connectors for all exposed parking structure raceways and boxes.
- V. Provide bell ends on all conduits into pullboxes and manholes, seal all conduits after conductors are pulled.
- W. Cap all unused conduits with end cap. Do not tape.
- X. All Fire Alarm Conduits shall be painted red.

END OF SECTION

SECTION 26 0120

CONDUCTORS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Conductors; for power, lighting, sound, communication and control, including conductors for general wiring, flexible cords and cables, and ground conductors.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Submittals: Section 260000.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION

- A. Conductors for General Wiring: Thermoplastic insulated rated for 600V manufactured in accordance with UL 83.
 - 1. Provide 3/4 hard drawn copper conductors. Provide solid conductor for #12 AWG and smaller. Provide stranded conductors for #10 AWG and larger.
- B. Conductor Connectors for General Wiring:
 - 1. Sizes No. 14 to No. 8: Splice with insulated spring wire connectors.
 - a. Ideal No. 451, 455 and 453.
 - b. Minnesota Mining: Types Y, R, G, and B.
 - c. Buchanan No. B1, B2 and B4.
 - 2. Size No. 6 or Larger, Copper: Splice and terminate with compression or pressure type connectors and terminal lugs.
- C. Provide connector sealing packs for all area lighting and exterior box splices which require complete protection from dampness and water.
 - 1. Scotchlok No.'s 3576, 3577 and 3578, by 3M Company.

PART 3 - EXECUTION

3.01 USE

A. Conductors for General Wiring:

1. Minimum 75 degrees C temperature rated insulation on conductors, except use minimum 90 degrees C temperature rated insulation on conductors in conduits exposed on roof, or where required due to ambient temperature.
2. Stranded conductors at motors, audio video and other applications where subject to vibration.
3. Minimum size conductors for power and lighting #12 AWG, except where noted.
4. Minimum size conductors for control circuits #14 AWG stranded with THHN/THWN insulation.

B. Use flexible cords and cables for connection of special equipment as indicated. Length not to exceed 72 inches.

C. Ground Conductors:

1. Provide an insulated green ground conductor for all branch circuit wiring where indicated.
2. Bare copper conductor may be used.
 - a. Install ground conductors in all non-metallic conduits as required by code. Install ground conductors in all motor branch circuits and all feeders. Where ground conductor size is not indicated, provide size as required for an equipment ground conductor by the National Electrical Code.
 - b. Install ground conductors in all flexible metal conduits.

D. Install XHHW – 2, 90°C copper conductors for all underground installations unless noted otherwise on the plans.

E. Install for all dimmers, stranded THHN/THWN – 2 copper 90°C conductors with dedicated neutrals.

3.02 INSPECTION

A. Check conduit system for damage and loose connections, replace damaged sections.

- B. Check for caps at conduit openings. Make sure that inside of conduit is free of dirt and moisture.
- C. Pull mandrel, one size smaller than the conduit, through entire length of all underground conduits prior to conductor installation.

3.03 INSTALLATION

A. Conductors for General Wiring:

- 1. Color code conductors insulation as follows:

CONDUCTOR	SYSTEM 208Y/120	VOLTAGE 480Y/277
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow

- 2. For conductors #6 AWG or larger, permanent plastic colored tape may be used to mark conductor in lieu of coded insulation. Tape shall cover not less than 2 inches of conductor insulation within enclosure.
 - a. Provide color tape on each end and at all terminal points and splices on wire enclosed in conduit.
 - b. Provide color tape every 3 feet on wire not enclosed in a listed wireway.
- 3. When pulling conductors, do not exceed manufacturer's recommended values.
- 4. Use polypropylene or nylon ropes for pulling conductors.

- B. Insulate splices with plastic electrical tape: Scotch No. 33+, Tomic No. 1T, or equal.
- C. Terminate all control wires with terminal lugs on terminal boards not designed with pressure plates. If splices are needed, use same procedure, installing a terminal board in a junction box for protection.
- D. All splices or connections shall be compression type Thomas & Betts or Burndy, no split bolt connections are allowed.

3.04 IDENTIFICATION

- A. Feeders: Identify with the corresponding circuit designation at over-current device and load ends, at all splices and in pull boxes.

- B. Branch Circuits: Identify with the corresponding circuit designation at the over-current device and at all splices and devices.
- C. Control Wires: Identify with the indicated number and/or letter designation at all terminal points and connections.
- D. Alarm and Detection Wires: Identify with the indicated wire and zone numbers at all connections, terminal points, and coiled conductors within cabinets.
- E. Conductors Terminated By Others: Indicate location of opposite end of conductor, i.e., Pull Box-Room 101.
- F. For identification of conductors, use heat shrinkable white marking sleeves such as Brady Permasleeve with type written identification.
- G. Circuit designation is construed to mean panel designation and circuit number, i.e., LA-13.

END OF SECTION

SECTION 26 0130
ELECTRICAL BOXES

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Boxes; including:
 - 1. Outlet boxes.
 - 2. Pull and junction boxes.
 - 3. Cabinets.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Submittals: Section 260000.
- B. Support Material: Section 260190.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION

- A. Outlet Boxes:
 - 1. Pressed Steel Boxes: Knockout type, hot-dipped or electro-plate galvanized.
 - 2. Cast Iron Boxes: Hot-dipped or electro-plate galvanized with threaded hubs.
 - 3. Cast Iron Conduit Bodies: Hot-dipped or electro-plate galvanized with threaded hubs.
 - 4. Cast copper free aluminum conduit bodies with threaded hubs.
 - 5. Covers for Pressed Steel Boxes: Hot dipped or electro-plate galvanized.
 - 6. Outlet boxes manufactured in accordance with UL 514.
- B. Pull and Junction Boxes:
 - 1. Sheet steel, hot-dipped or electro-plate galvanized, or prime coated and a final coat of manufacturer's standard enamel or lacquer finish. Manufactured in accordance with UL 50.

- a. Where exposed to weather, provide raintight hubs for conduits entering the boxes, top and sides only.
- 2. Floor Boxes:
 - a. Single gang, similar to Hubbell #B-2536.
 - b. Covers:
 - 1) Combination, similar to Hubbell #S-2525.
 - 2) Duplex receptacle, similar to Hubbell #S-3925.
 - c. Carpet flange, similar to Hubbell #S-3075 thru #S-3079.
 - d. Hubs: Provide hubs as required to suit the conduit arrangement.
- 3. Pre-Cast Concrete Pull Boxes: As manufactured by Jensen Pre-Cast or Utility Vault and shown on drawings.
- 4. High impact resistant PVC boxes: As manufactured by Carlon, Sedco, or R & G Sloan.
- C. Cabinets: Sheet metal, prime coat and final coat of manufacturer's standard enamel or lacquer finish. Manufactured in accordance with UL 50.
 - 1. Control Cabinet: NEMA 1 enclosure, door with butt hinges and flush handle latches.
 - a. Provide with removable steel back panel.
 - 2. Terminal Cabinets: NEMA 1 enclosure, door with concealed hinges and spring catch type flush cylinder locks. Key locks alike, provide two keys with each lock.
 - 3. Provide engraved plastic nameplates with 1/2" minimum height letters indicating designation of control and terminal cabinets as shown on the drawings.
 - a. Secure nameplates with at least two screws or rivets. Cementing and adhesive installation not acceptable.

PART 3 - EXECUTION

3.01 USE

A. Outlet Boxes:

1. Ceiling Outlet Boxes: Not less than 4" octagonal by 2" deep.
2. FDD cast iron or cast aluminum device boxes and conduit bodies with metal covers for exposed conduit installation. Provide gasket for covers in wet areas.
3. Intercom, Microphone and TV Outlet Boxes: Not less than 4-11/16" square x 2-1/8" deep.
4. Provide floor boxes with quantity of gangs as required for power, communication or control as indicated. Use boxes with barriers where required. Provide carpet flanges in carpeted areas.

B. Pull and Junction Boxes:

1. Use sheet steel boxes NEMA Type 1 for indoor and NEMA Type 3R for outdoor installation, except as follows.
2. Use pre-cast concrete boxes for boxes flush in finish grade where requiring a nominal capacity greater than 144 cubic inches, where located in vehicular traffic areas, or where indicated.
3. Use polyvinyl chloride (PVC) boxes flush in finish grade when the nominal internal volume is less than or equal to 144 cubic inches or where indicated.
4. Use cast iron boxes for boxes flush in slab on grade.

3.02 INSTALLATION

- A. Provide 3/8" fixture studs in wall bracket and ceiling boxes.
- B. Provide covers suitable for the fixtures or devices used.
- C. Make outlet box covers flush with finished surfaces.
- D. Close unused open knockouts with knockout seals.
- E. Provide 1" deep plaster rings on recessed outlet boxes installed in areas where concrete will be exposed after construction is complete.
- F. Where boxes are concealed in exposed concrete unit masonry, use square cornered types or boxes fitted with rings of sufficient depth for the box to be recessed completely within cavity of block or tile. Install box to insure that ring fits an opening sawed out of the masonry, so that no mortar is required to fill between ring and construction.
- G. Provide a 6" base of compacted crushed rock under pre-cast concrete pull boxes.

- H. Adjust floor boxes so they are level with top of finished floors.
- I. Provide pull boxes and junction boxes in all branch circuit and feeder runs as indicated. Do not provide pull boxes unless they are indicated or required by the Electrical Code.

3.03 IDENTIFICATION

- A. Junction Boxes: Use permanent black marker, 2" high lettering, and on each cover plate indicate the power source and circuits contained within that junction box.

END OF SECTION

SECTION 260140
WIRING DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Wiring devices.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Identification: Section 260030.
B. Boxes: Section 260130.

1.03 Submittals

- A. In accord with Section 260010.

1.04 DEFINITION

- A. Wiring devices: This term includes all wall switches, pushbuttons, receptacles, and plates used for general purpose installation.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION

- A. Wall switches:

1. Quiet toggle type, 20A – 120/277 VAC rated, with terminal screws to take up to No. 10 AWG conductors:

	SPST	DPST	3-WAY	SPST KEY SWITCH LOCK	4-WAY
Arrow-Hart	1991-I	1992-I	1993-I	1991-L	1994-I
Bryant	4901-I	4902-I	4903-I	4901-L	4904-I
General Electric	GE5951-2	GE5952-2	GE5953-2	GE5951-OL	GE5954-2
Hubbell	1221-I	1222-I	1223-I	1221-L	1224-I
Pass & Seymour/ Legrand	20AC1-I	20AC2-I	20AC3-I	20AC1-L	20AC4-I

2. Momentary contact type, 20A-120/277V, two-circuit, three-position, center off:

Arrow-Hart	1995-I
Bryant	4921-I
General Electric	GE5935-2
Hubbell	1557-I
Pass & Seymour/Legrand	1250-I

3. Passive infrared wall switch sensors: Ivory, 180° field of view, adjustable time out and ambient light, 1200 sq. ft. Coverage, 120 VAC, 60 Hz, 1500W. Maximum load, incandescent and fluorescent. As manufactured by Hubbell No. AT1201 or Owner- approved equivalent by Leviton or Pass & Seymour.
4. Fan speed controllers: AC unit rated 15A - 120V used to control up to twelve 56 in./52 in./48 in. ceiling fans or up to twenty 42 in. fans on a single circuit. Rinaudo's Reproductions No. 22394.

B. Passive infrared motion switching system:

- Ceiling mount sensor, white, 500 sq. ft. coverage, requires control unit. Hubbell No. ATD500CRP.
- Ceiling mount sensor, white, 2000 sq. ft. coverage, ceiling height dependent, requires control unit. Hubbell No. ATD2000CRP.
- Ceiling or wall mount sensor, white, 1000 sq. ft. coverage, requires control unit. Hubbell No. ATD1000CRP.
- Ceiling or wall mount hallway sensor, white, covers area 75 ft. long by 20 ft. wide, requires control unit. Hubbell No. PIR90HW1.
- Low-voltage control unit, 120VAC, controls one to four sensors. Mount in 4 in. x 4in. enclosure. Hubbell No. CU120A.
- Relay, 120VAC coil, used when load to be controlled exceeds capacity of a single circuit. Hubbell No. AAR

C. Receptacles, caps, and connectors:

1. 15A-125V, NEMA 5-15, parallel slot type with grounding pin:

	DUPLEX	SINGLE	GFI
Arrow-Hart	5252-I	5261-I	GF5242-I
Bryant	5252-I	5261-I	GFR52FT
General Electric	5252-2	5261-2	TGTR115F
Hubbell	5252-I	5251-I	GF5252-I
Pass & Seymour/Legrand	5252-I	5261-I	1591-SHG

2. 15A-250V, NEMA 6-15, straight blade grounding type:

	RECEPTACLE	CAP
Arrow-Hart	5661-I	6666
Bryant	5661-I	5666-N
General Electric	GE4069-2	GED0611
Hubbell	5661-I	5666-C
Pass & Seymour/Legrand	5662-I	5666-X

3. 15A-125V, NEMA L5-15, locking type with ground:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	4700	4721	4731
Bryant	4700	4721-NSY	4732-NSY
General Electric	GL4700	GLD0511	GLD0513
Hubbell	4700	4720-C	4729-C
Pass & Seymour/Legrand	4700	L515-P	L515-C

4. 20A-125V, NEMA 5-20, straight blade grounding type:

	RECEPTACLE	CAP
Arrow-Hart	5361-I	5362-I
Bryant	5361-I	5362-I
General Electric	GE4102-2	GE4108-2
Hubbell	5361-I	5362-I
Pass & Seymour/Legrand	5361-I	5362-I

5. 20A-125V, NEMA L5-20, two-pole, three-wire locking type, with ground:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	6200	6202	6204
Bryant	70520-FR	70520-NP	70520-NC
General Electric	GL0520	GLD0521	GLD0523
Hubbell	2310-A	2311	2313
Pass & Seymour/Legrand	L520-R	L520-P	L520-C

6. 20A-125V, NEMA 5-20, two-pole, three-wire, straight blade isolated grounding type receptacle:

	DUPLEX	SINGLE
Arrow-Hart	IG5362	IG5361
Bryant	5362-IG	5361-IG
General Electric	GE8300-IG	GE8310-IG
Hubbell	IG-5362	IG-5361
Pass & Seymour/Legrand	IG-6300	IG-5361

7. 20A-125 VAC, two-pole, three-wire, NEMA 5-20, straight blade, specification grade, ivory color, ground fault circuit interrupter receptacle (GFCI), rated for feed-through wiring, with LED indicator light:

	GFCI RECEPTACLE
Hubbell	GF-5362I
Pass & Seymour	2091-S-L-I
Leviton	6898-I

8. 20A-125/250V, NEMA 14-20, three-pole, four-wire straight blade grounding type:

	RECEPTACLE	CAP
Arrow-Hart	5759	5757
Bryant	-	-
General Electric	GE1420	GED1421
Hubbell	8410	8411-C
Pass & Seymour/Legrand	L1420-R	L1420-P

9. 20A-250V, NEMA 6-20, two-pole, three-wire straight blade grounding type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	8510	6866	6869
Bryant	5461	5466N	5469N
General Electric	GE4182	GED0621	GED0623
Hubbell	5461	HBL5466-C	HBL5469-C
Pass & Seymour/Legrand	5871	5466-X	5469-X

10. 20A-120/208V, NEMA L21-20, four-pole, five-wire locking and grounding type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	6470	6472	6474
Bryant	72120-FR	72120-NP	72120-NC
General Electric	GL2120	GLD2121	GLD2123
Hubbell	2510A	2511	2513
Pass & Seymour/Legrand	L2120R	L2120P	L2120C

11. 20A-250V, NEMA L6-20, two-pole, three-wire locking and grounding type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	6210	6212	6214
Bryant	70620FR	70620NP	70620NC
General Electric	GL0620	GLD0621	GLD0623
Hubbell	2320A	2321	2323
Pass & Seymour/Legrand	L620-R	L620-P	L620-C

12. 20A-480V, NEMA L16-20, three-pole, four-wire locking type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	6430	6432	6434
Bryant	71620-FR	71620-NP	71620-NC
General Electric	GL1620	GLD1621	GLD1623
Hubbell	2430A	2431	2433
Pass & Seymour/Legrand	L1620-R	L1620-P	L1620-C

13. 30A-125V, NEMA 5-30, two-pole, three-wire straight blade grounding type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	5716N	5717N	6716N
Bryant	9530-FR	9630-RP	-
General Electric	GE4138-3	GED0531	GED0533
Hubbell	9308	9309	-
Pass & Seymour/Legrand	3802	5921	-

14. 30A-125V, NEMA L5-30, two-pole, three-wire grounding and locking type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	6330	6332	6334
Bryant	70530-FR	70530-NP	70530-NC
General Electric	GL0530	GLD0531	GLD0533
Hubbell	2610	2611	2613
Pass & Seymour/Legrand	L530-R	L530-P	L530-C

15. 30A-125/250V, NEMA 14-30, three-pole, four-wire straight blade grounding type:

	RECEPTACLE	CAP
Arrow-Hart	5744N	5746N
Bryant	9430-FR	5746
General Electric	GE4191-3	GED1431
Hubbell	9430	9431
Pass & Seymour/Legrand	5740	5741-AN

16. 30A-125/250V, NEMA L14-30, three-pole, four-wire grounding and locking type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	6510	6512	6514
Bryant	71430-FR	71430-NP	71430-NC
General Electric	GL1430	GLD1431	GLD1433
Hubbell	2710-A	2711	2713
Pass & Seymour/Legrand	L1430-R	L1430-P	L1430-C

17. 30A-250V, NEMA L6-30, two-pole, three-wire locking blade grounding type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	6340	6342	6344
Bryant	70630-FR	70630-NP	70630-NC
General Electric	GL0630	GLD0631	GLD0633
Hubbell	2620-A	2621	2623
Pass & Seymour/Legrand	L630-R	L630-P	L630-C

18. 30A-250V, NEMA 6-30, two-pole, three-wire straight blade grounding type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	5700N	5701N	6700N
Bryant	9630-FR	9630-ANP	-
General Electric	GE4139-3	GE4328-9	GE4373-9
Hubbell	9330	9331	-
Pass & Seymour/Legrand	3801	5931	-

19. 50A-208V (50A-600V), three-pole, four-wire locking type with ground:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	3769	3765	3764
Bryant	3769	3765	3764
General Electric	LD3769	LD3765	LD3764
Hubbell	3769	3765-C	3764-C
Pass & Seymour/Legrand	3769	3765	3764

20. 50A-125/250V, NEMA 15-50, three-pole, four-wire grounding straight blade type:

	RECEPTACLE	CAP
Arrow-Hart	5754N	5745N
Bryant	9450-FR	5745
General Electric	GE4181-3	GE4180-3
Hubbell	9450	9451
Pass & Seymour/Legrand	5750	5751-AN

21. 50A-125/250V, three-pole, four-wire grounding locking blade type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	CS6369	CS6365	CS6364
Bryant	CS6369	CS6365	CS6364
General Electric	-	-	-
Hubbell	CS6369	CS6365	CS6364
Pass & Seymour/Legrand	-	-	-

22. 50A-250V, NEMA 6-50, two-pole, three-wire grounding straight blade type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	5709N	5710N	6709N
Bryant	9650-FR	9650-RP	-
General Electric	GE4141-3	GED0651	GED0653
Hubbell	9367	9368	-
Pass & Seymour/Legrand	3804	3869	-

23. 60A-120/208V, three-phase, 60 Hz, five-pole, five-wire, watertight, with threaded cap:

	BOX	ANGLE ADAPTER	RECEPTACLE BODY	COMPLETE ASSEMBLY
Hubbell	26401	26404	26520	-
Crouse-Hinds	-	-	-	Area-6575
Russell Stoll	-	-	-	DS6516-FRAB-

24. 60A-480V, NEMA L16-20, three-pole, four-wire locking type:

	RECEPTACLE	CAP	CONNECTOR
Arrow-Hart	-	-	-
Bryant	-	-	-
General Electric	-	-	-
Hubbell	HBL 26410	HBL 26402	HBL 26418
Pass & Seymour/Legrand	-	-	-

- D. Safety receptacle: 15A-125V, NEMA 5-15, straight blade grounding safety receptacle, Hubbell No. SG-62H-1.

- E. Door monitoring switches:

- General: Provide magnetic door switches (one per leaf) and key switches at specific door locations as indicated on Drawings. Refer to Electrical Drawings details for schematic installation details of door switches.
- Magnetic contact switches: Provide concealed magnetic SPDT switches with minimum 6-ft. wire leads, Sentrol No. 1076W-06 for hollow metal doors and frames. Where necessary, provide other similar Sentrol types to suit concealed installation conditions, as approved by Owner and compatible with Owner's ride control and/or existing security system equipment. Color of switches to closely match finish or paint color of door frame.
- Key switches: Arrow-Hart No. 1191L.

- F. Device cover plates:

- Interior plates: Specification grade plastic, 0.1 in. thick, ivory in color, UL listed.

- a. Plates in kitchens and restrooms to be polished stainless steel, 0.040 in. thick except in kitchens use double lift lid weatherproof gasketed plates for convenience receptacles.
 - b. MATV plate: RMS No. CA-4028.
2. Exterior plates: Choose type of exterior cover plate in accord with the device location and/or manner in which device will be used. Device cover plates shall be die-cast aluminum with hinged cover, rated for respective type of use specified below, or as indicated on Drawings.
- a. Outlet box weatherproof hoods: NEMA 3R rating, gasketed, for unattended use with cover closed, padlockable latching cover to meet OSHA lockout/tagout requirements, large cord opening and UL listed. As manufactured by Hubbell, Intermatic or Leviton.
 - b. Low profile weatherproof cover: Gasketed, approved for use with cover open, self-closing hinged covers (two independent self-closing lids for duplex receptacles which are horizontally mounted), UL listed. As manufactured by Hubbell, Leviton or Pass & Seymour.
 - c. Communication outlet weatherproof hoods: NEMA 3R rating for unattended use with cover closed, two-cord openings and UL listed. As manufactured by Red Dot.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Mount switches and receptacles in vertical position in building interiors.
- B. Mount receptacles with weatherproof plates in horizontal position.
- C. Install receptacles mounted vertically so that the ground contact falls on the top position, and horizontally-mounted receptacles with neutral pole in top position.
- D. Use plastic blank plates on J-boxes in public areas.
- E. Use mechanical type door switches for load control.
- F. Install receptacles for plug in lighting fixtures within 36 in. of fixture location.
- G. Use safety type receptacles with low profile weatherproof metal covers for all convenience outlets in guest accessible areas (i.e., queue lines, waiting areas, etc.).

- H. All GFI type exterior receptacles shall be provided with weatherproof metal hoods.
- I. GFI type receptacles shall not be fed-through wire.

END OF SECTION

SECTION 26 0142

NAMEPLATES AND WARNING SIGNS

PART 1 - GENERAL

Not Used.

PART 2 - PRODUCTS

2.01 NAMEPLATES

- A. Nameplate shall be plastic laminate with 3/4" high letters in white on black background screwed onto equipment designations shall clearly state:
1. Equipment Enclosure Nameplates.
 - a. Manufacturer's nameplate including equipment design rating of current, voltage, KVA, HP, bus bracing rating, or as applicable.
 - b. Equipment nameplate designating system usage and purpose, system nominal voltage, equipment rating for KVA, amperes, HP and RPM as applicable. Designation data per drawings or to be supplied with shop drawings approval.
 2. Device nameplates: Device usage, purpose, or circuit number; manufacturer and electrical characteristic ratings including the following:
 - a. Circuit Breakers: Voltage, continuous current, maximum interrupting current and trip current.
 - b. Switches: Voltage, continuous current, horsepower or maximum current switching. If fused, include nameplate stating "Fuses must be replaced with current limiting type of identical characteristics."
 - c. Contactors: Voltage, continuous current, horsepower or interrupting current, and whether "mechanically-held" or "electrically-held".
 - d. Motors: Rated voltage, full load amperes, frequency, phases, speed, horsepower, code letter rating, time rating, type of winding, class and temperature.
 - e. Controllers: Voltage, current, horsepower and trip setting of motor running over current protection.

2.02 WARNING SIGNS

- A. Warning signs shall be minimum 18 gauge steel, white porcelain enamel finish with red lettering. Lettering to read "DANGER - HIGH VOLTAGE" in 1" letters. Warning signs to be included on door or immediately above door of all electrical equipment rooms, vaults or closets containing equipment rooms, vaults or closets containing equipment energized above 150 volts to ground, except where such spaces are accessible from public areas.

2.03 WARNING SIGN DESIGNATION

- A. Warning designation in 1" red letters shall be painted by stencil or pre-printed adhesive on each pull box, cabinet or 1-foot length of exposed conduit stating "DANGER" and giving voltage of enclosed conductors such as "DANGER - 480 VOLTS", for all systems over 150 volts to ground.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Nameplates shall be mounted by self-tapping or threaded screws and bolts or by rivets.
- B. Signs shall be permanently mounted with cadmium plated steel screws or nickel-plated brass bolts.

END OF SECTION

SECTION 26 0164

BRANCH CIRCUIT PANELBOARDS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Branch circuit panelboards.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Submittals: Section 260000.
- B. Overcurrent Protective Devices: Section 260180.
- C. Control Devices: Section 264901.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION

- A. Provide factory assembled, enclosed panelboards in dead front cabinets, with doors, surface mounted or recessed as indicated, not less than 20" wide and 5-3/4" deep. Height will depend on the number of breakers and spaces. Front cover shall have continuous hinge to allow for the front panel to be hinged open while still being attached to the panel box enclosure.
- B. Where a control compartment is indicated, provide an integral compartment with a separate hinged lockable door held with captive screws. Identify all internal control wiring with manufacturers wire numbering or control wire numbering when indicated, at all terminal points and connections.
- C. Provide feeder terminal lugs for both main lugs only and main breakers rated for use with copper conductors.
- D. Provide full length copper bussing including areas indicated as space only.
- E. Provide full size neutral bus where neutral bus is indicated. Provide equipment ground bus and bolt-on circuit breakers.
- F. Key all door locks alike.
- G. 120/208V, 3 Phase, 4 Wire Panelboards: Square-D Co. Type NQOD
- H. 277/480V, 3 Phase, 4 Wire Panelboards: Square-D Co. Type NF

- I. All equipment shall be listed to meet or exceed the available fault current by 10%.
- J. Doors shall be hinged.
- K. All placards are welded steel type.
- L. Provide hinged dead front doors to allow internal access to panel without totally rewiring cover panel.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Secure panelboards to building structure to withstand wire pulling strains.
- B. Secure surface mounted panelboards to wood studs or channel material spanning metal studs.
- C. Do not use toggle bolts.
- D. Contractor shall program lighting control Powerlink panelboard per owner's requirements.

3.02 LABELING AND IDENTIFICATION

- A. Provide engraved plastic nameplates on all branch circuit panelboards shown on the single line diagram.
- B. Provide panelboard and source feed designation on nameplates with 3/8" minimum height lettering for the panel name and 1/4" height lettering for the source feed designation.

EXAMPLE: Panel LA – 200A @ 120/208vac fed from Panel DB

- C. Secure nameplates with at least two spaces or rivets. Cementing and adhesive installation not acceptable.
- D. Provide a typewritten directory for each branch circuit panelboard, showing each circuits and its use. Provide metal directory frame with plastic window.

END OF SECTION

SECTION 26 0190
SUPPORT DEVICES

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Support devices for conduit, boxes, lighting fixtures and equipment.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Hangers, Straps and Beam Clamps:
 - 1. Efcor.
 - 2. Raco, Inc.
 - 3. Steel City.
 - 4. O.Z./Gedney Co.
 - 5. Caddy Fastening System by ERICO Products Inc.
- B. Channels and Fittings:
 - 1. Kindorf.
 - 2. Unistrut Corp.
- C. Anchors:
 - 1. Acherman-Johnson Corp.
 - 2. Phillips Drill Co.
 - 3. Rawl Products Co.

2.02 MATERIAL AND FABRICATION

- A. Hangers: Steel cadmium plated.
- B. Straps: One-hole and two-hole malleable iron, hot-dipped galvanized or steel, cadmium or zinc plated.

- C. Beam Clamps: Malleable iron, hot-dipped galvanized or cadmium plated.
- D. Channels and Fittings:
 - 1. Channels: Hot-dipped galvanized.
 - 2. Fittings: Galvanized.
- E. Anchors: Self drilling and expansion bolt types. No wood or fiber plugs or concrete nails are acceptable.

PART 3 - EXECUTION

3.01 USE

- A. Use one-hole or two-hole straps for single conduit runs on walls or ceilings.
- B. Use hangers with solid steel rods for hanging single conduits.
- C. Use formed channel trapezes for groups of two or more conduits.
- D. To fasten boxes and supports to:
 - 1. Wood: Use wood screws or screw type nails of equal holding power.
 - 2. Brick and Concrete: Use bolts and expansion shields.
 - 3. Hollow Masonry Units: Use toggle bolts.
- E. Support sheet metal boxes from building structure directly or by bar hangers.
- F. Do not penetrate reinforced concrete beams with fastenings more than 1-1/2" or reinforced concrete joints with more than 3/4" fastenings to prevent contact with reinforcing steel.

END OF SECTION

SECTION 26 2450

GROUNDING

PART 1 - GENERAL

1.01 REFERENCES

- A. N.E.C.: Article 250 "Grounding".
- B. Underwriter's Laboratories (U.L.). Standard A67 - "Grounding and Bonding Equipment". STD 869 - Grounding and Bonding.
- C. ITEE - Standards 142 and 241.

1.02 DESCRIPTION OF SYSTEM:

- A. A permanent grounding system with methods and materials in accordance with applicable Codes and Standards, able to conduct ground fault currents to the grounded neutral of electrical distribution systems, and limit potential differences between grounding conductors, raceways and enclosures.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's data on grounding systems and accessories.
- B. Shop Drawings: Submit layout drawings of grounding systems and accessories including, but not limited to, ground wiring, copper braid and bus, ground rods, and plate electrodes.

1.04 QUALITY ASSURANCE:

- A. Installer qualifies with at least 3 years of successful installation experience on projects with electrical grounding experience similar to that required for project.

1.05 DELIVERY, STORAGE, AND HANDLING:

- A. Handle electrical grounding accessories and components carefully to avoid damage. Store in location that will protect from dirt and weather.

PART 2 - PRODUCTS

2.01 GROUND RODS:

- A. Copper clad steel, unless indicated otherwise. Minimum dimension of 5/8" diameter by 8' long or larger if indicated and sectional rods with couplings where lengths exceeding 12' are specified or indicated, or where added driving depth is required to achieve a specified minimum resistance.

2.02 GROUNDING ELECTRODE:

- A. Bare stranded copper, 3/0 AWG unless indicated otherwise, for installation in soil or embedded in concrete and cable with type TW insulation when installed in raceway. Install without splice from connection to connection.

2.03 GROUNDING CONDUCTORS:

- A. Type TW insulation, unless specified or indicated otherwise with a continuous green outer insulating jacket for size #6 AWG and smaller and with green tape banding for #4 AWG and larger, marked at each access point (e.g.: Junction boxes, Enclosures).

2.04 CLAMPS AND PRESSURE CONNECTORS:

- A. Cast copper, copper alloy, or bronze alloy suitable for use with aluminum and copper. Double bolt type with formed shoe and "U" cable clamp for connection to pipe or conduit; Single bolt type with cable shoe and "U" clamp for connections to flat bar or metal; and double bolt, parallel conductor split clamp type for cable to cable connections.

2.05 WELDED CONNECTIONS:

- A. Exothermic process (Cadweld or Thermoweld).

2.06 EQUIPMENT ROOM GROUND TERMINAL BAR:

- A. Copper 1/4" X 2-1/2" X 24", unless otherwise indicated. Two rows of holes on 1-1/2" centers for 1/2" bolt, to receive cables from two directions.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Ground conductive raceways, cable trays and enclosures for electrical systems wiring. Make ground circuits complete to form permanent conductive paths. Solidly ground each low voltage electrical system unless indicated or specified as ungrounded, or grounded through an impedance of a specified value. Provide bare conductors when in open air or soil and provide 600 volt, green, insulated conductors when in raceway.

3.02 MAIN GROUNDING JUMPER:

- A. Install a main grounding jumper between the system neutral and the enclosure ground bus (or directly to enclosure where ground bus is not present) at each location where system grounding is required. Main grounding jumper:
 - 1. Formed bus in switchboards and panelboards.
 - 2. Formed bus or copper cable in transformers not coupled in unitized assembly with distribution equipment.

3.03 GROUND CONNECTIONS:

- A. Make grounding electrode connections electrically ahead of any overcurrent or disconnect device or tap connection such that disconnection of neutral load conductors does not interfere with or remove the system ground connection. Use separate lugs on the transformer neutral terminals for neutral and main grounding jumpers when cable is used for transformer connections.

3.04 SEPARATELY DERIVED SYSTEMS:

- A. For each separately derived system, grounded or ungrounded, install a grounding electrode conductor between each system enclosure ground bus (or bolted connection to enclosure where ground bus is not present) and a cold water pipe or building structural steel of one (1) inch size or larger near the separately derived system ground connection. Make connections to water pipes or steel accessible for easy inspection. Provide a separate ground conductor for each audio, video, isolated panels and UPS as noted on the plans.

3.05 SERVICE GROUND:

- A. For each low voltage service, install a grounding electrode conductor between the system enclosure ground bus and the water service entrance to the building and install bonding jumpers around insulating unions and removable fittings in the water pipe between the grounding electrode conductor connection to the water pipe and the water service entrance.

3.06 GROUNDING ELECTRODE SYSTEM:

- A. Install a complete grounding electrode system with interconnecting cables and terminations at the equipment room ground terminal bar. Make connections to the grounding electrode system accessible. Install the following grounding electrode systems:
 - 1. Metal frame of building.
 - 2. Grounding electrode encased by at least two inches of concrete, within and near the bottom of the building foundation or footing of the type specified in

Part 2 - Products, at least 20 feet in length without splice from connection to connection.

3. Connection of other metal piping systems as required by National Electrical Code Article 250.
4. Driven ground rods.
5. Driven steel piles.
6. Connection to water service with bonding jumper around water meter.

3.07 GROUNDING ELECTRODE CONDUCTORS:

- A. Install grounding electrode conductor in PVC or other non-conductive, non-metallic enclosure where a raceway system is indicated or necessary for conductor installation. Install grounding electrode conductors without splice from the enclosure ground bus to the connection at the grounding electrode system.

3.08 GROUND RODS:

- A. Install a vertical position, full length below grade unless specified otherwise, and with conductor and top of rod 6" minimum below grade. Provide exothermic welds at all connections.

3.09 EQUIPMENT ROOM GROUND TERMINAL BAR:

- A. Install in equipment rooms where indicated. Mount bar by anchors and bolts using 1-1/2" long segments of 1/2" rigid conduit as spacer between bar and wall. Use a minimum of two supports, 18" on center. Connect grounding electrode system conductors, system enclosure ground bus, and other indicated electrode systems to the terminal bar. Label permanently all ground conductors as to destination location, e.g. TR1, panel IPS, etcetera.

3.10 EQUIPMENT GROUND:

- A. Form the equipment ground circuits with rigid metallic raceways (e.g., EMT, rigid steel conduit) unless indicated otherwise. Make all threaded coupling connections wrench tight. Install bonding jumpers for continuity around fittings and terminations where the conductive raceway is made non-continuous. Where indicated or specified, install ground conductors in raceways to augment the circuits formed by the metallic raceway system. Bond the conductors to boxes or enclosures in which access is possible. Size conductors as specified, indicated, or required by code, whichever is larger. Install grounding bushings and bonding jumpers to enclosures or ground bussing for the following: Service entrance feeder; each location where multiple ring knockouts are damaged during conduit installation; each location where

conduits are stubbed up into floor mounted and each conduit termination at a painted enclosure where paint is not removed before installation of raceway.

3.11 FLEXIBLE RACEWAY GROUNDING:

- A. Install a ground conductor inside all flexible raceways (e.g., Flexible steel, liquid tight) regardless of length. Bond the conductor to the enclosure or ground bus in the nearest box or access on either side of the flexible section. Size conductor as specified, indicated, or required by code, whichever is larger.

3.12 NON-CONDUCTIVE RACEWAY:

- A. Install a ground conductor in raceways of non-conductive materials. Bond conductor to conductive enclosures in which access is possible. Bond non-current carrying conductive equipment contained in a non-conductive enclosure. Install insulated or bare conductors, sized as specified, indicated, or required by code, whichever is larger.

3.13 SECTIONAL RACEWAY:

- A. Install a ground conductor in sectional raceways with removable covers for access (e.g., Plug-in strips, surface raceway systems, and wireways) unless specified otherwise. Size conductor in accordance with the N.E.C. for the largest phase conductor size installed in raceway, or as indicated. Bond sections of the raceway to the ground conductor. Connect receptacle ground terminals in the raceway to the ground conductor, and make other ground connections indicated on the drawings.

3.14 CABLE SUPPORT SYSTEMS:

- A. Ground elements of the cable support system to panelboards, cabinets and switchboards from which their circuits originate. Install a ground conductor sized as required by code, as indicated, or #12 AWG, whichever is larger.

3.15 MULTI-CONDUCTOR CABLE, METALLIC SHEATH:

- A. Use multi-conductor cable with metallic sheath or armor approved for use as ground circuit conductor or install ground conductor(s). Size ground circuit conductor as required by code, as specified, or as indicated on the drawings, whichever is larger. Terminating devices for cable using the sheath or armor as the ground circuit conductor shall be approved for use as the connecting device between the cable and the enclosure. Terminate internal ground circuit conductors by lug to the interior of the enclosure or to the contained ground bus where present. Use bare or clearly identified internal grounding conductors.

3.16 MULTI-CONDUCTOR CABLE, NON-METALLIC SHEATHED:

- A. Use only non-metallic sheathed multi-conductor cables having a ground circuit conductor enclosed in the sheath the same size as the ungrounded conductors. Use bare or clearly identified internal grounding conductors. Terminate ground circuit conductor by lug to the enclosure ground bus where present or to the interior of the enclosure.

3.17 GROUND CONDUCTOR BONDING:

- A. Bond grounding conductors to boxes or enclosures at each access point. Do not use building steel as equipment grounding path. Use welded ground connections, at least where such are buried in soil, installed below slabs on grade, or embedded in concrete.

3.18 GROUND CONDUCTOR TESTING:

- A. Each ground rod connection shall be separately tested and shall not have an earth resistance in excess of 20 ohms. Additional rods shall be installed no closer than 20 feet and connected with the same size ground conductor as noted on the plans (but not less than a #2 copper bare conductor) to achieve this minimum value.

END OF SECTION

SECTION 26 2510
LIGHTING FIXTURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Lighting fixtures, including lamps, accessories and support materials.

B. Related work:

1. Submittals: Section 01 3300.
2. Outlet and Junction Boxes: Section 26 0130.
3. Supporting Devices: Section 26 0190.
4. Contactors, Relays, Time Switches, Photocontrols, etc.: Section 26 4901.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION

- A. Fixtures schedule lists one or more acceptable manufacturers for each fixture type.
- B. Provide all lighting fixtures of each type from the same manufacturer or representative if possible.
- C. Provide sockets for screw base lamps of plated steel, brass or bronze.
- D. Lamps Acceptable Manufacturers:
 1. Osram.
 2. Phillips.
 3. Sylvania.
 4. As indicated for specialty lamps.
- E. Flexible metal conduit systems connecting individual tandem wired lighting fixtures.

1. Conductors carrying line voltage and current shall be sized in accordance with the overcurrent device protecting the circuit indicated.
 2. Provide a #12 AWG minimum size ground conductor.
- F. Provide electronic ballasts for all fixtures.
- G. Do not provide wireless control for room fixtures.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Provide a lighting fixture for each lighting outlet indicated.
- B. Provide recessed and semi recessed fixtures with mounting frames compatible with the ceiling and wall systems employed and secure fixture mechanically to frame.
- C. Align rows of suspended and surface mounted fluorescent fixtures to form straight lines at uniform elevations.
- D. Provide swivel ball type hangers which will allow a minimum of 45 degrees angle for fixtures indicated as pendant mounted.
- E. Make recessed fixture fit snugly against ceiling to prevent light leakage.
- F. Support suspended and surface mounted LED fixtures as follows:
1. Fixtures not over 12 inches wide and not over 50 inches long, a minimum of two fastenings.
 2. Fixtures not over 12 inches wide and over 50 inches long, a minimum of three fastenings.
 3. Fixtures over 12 inches wide and not over 50 inches long, a minimum of four fastenings.
- G. Support pendant mounted LED fixtures as follows:
1. Single fixtures not over 12 inches wide, a minimum of two single pendants.
 2. Single fixtures over 12 inches wide, a minimum of two single pendants at each end or one double pendant at each end.
 3. Continuous rows of fixtures not over 12 inches wide, a minimum of one single pendant for each fixture plus one for each row.

4. Continuous rows of fixtures over 12 inches wide, a minimum of two single pendants or one double pendant for each fixture plus one for each row.
 5. Locate pendants for continuous row fixtures at each joint and each end of row.
 6. Rigidly fasten continuous row fixtures together with fixtures manufacturer supplied joiner.
- H. Provide each lighting fixture with the lamps indicated on the fixture schedule.
- I. Clean and relamp existing fixtures to be reused.
- J. EMT shall not be used to support suspended fixtures of any type. Suspension shall be by means of standard hangers, where available and applicable, by rigid threaded conduit and fittings, or by rods.
- K. Where fixtures are to be mounted on, or suspended from concrete ceiling, provide cast in place inserts.
- L. Fixtures shall not be supported by outlet box cover screws alone; provide a fixture stud or “hickey” for added support.
- M. Provide a junction box at each exit light fixture indicated.
- N. Provide weatherproof boxes and connectors and liquid tight flexible conduit to each light fixture.
- O. All suspended fixtures will be installed with 1/8-inch safety cable and four Crosby clamps (two top and two bottom) to be used as a fixture support backup.

END OF SECTION

SECTION 26 4721

AUTOMATIC EMERGENCY VOICE EVACUATION FIRE ALARM SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

- A. This specification document provides the requirements for the Fire Alarm Systems throughout the facility. These systems shall include, but not be limited to, system terminal cabinets, signal power boosters, backboards, terminal strips, devices with termination, wire/cabling, testing and verification and other relevant components. The contractor shall include all costs for devices, wire, cable, panels, installation labor, tests, approvals and as-built documentation. Additionally, the contractor will be required to provide the necessary interfaces (control modules, etc.) to the monitoring system in which audio is incorporated. All conduits for the fire alarm systems and associated wiring shall be included. The fire alarm contractor shall provide “shop” drawing layouts to owner showing device locations mounting heights and conduit size requirements.

1.02 WORK INCLUDED

A. General Requirements:

1. The contractor shall furnish and install an automatic addressable fire amplifier alarm, signal booster panels, Manual Pull Stations, Smoke Detectors, Heat Detectors, system alarm connections, connection to building water flow, tamper and post indicator valves, Alarm Speakers, Alarm Strobes, Alarm Speakers/Strobes, Alarm Mini-Speakers as required by code and as specified herein.
2. Labeling: All system equipment shall be labeled with the manufacturer's name and logotype to assure the integrity of the complete system.

1.03 RELATED WORK DOCUMENTS – REFERENCE APPLICABLE SPEC SECTIONS:

- A. Submittals.
- B. Coordination
- C. Electrical General Requirements
- D. Electrical Raceway

- E. Electrical Conduit
- F. Electrical Outlet and Junction Boxes
- G. Electrical Interior Pull boxes and wireways
- H. Electrical Grounding systems
- I. Fire Alarm Audio Evacuation Systems
- J. Mechanical Plans (connections to heating and air conditioning units)
- K. Plumbing Plans (sprinkler flow, tamper and Post Indicator Valve locations)
- L. Systems Plans (monitoring systems)
- M. Electrical Plans

1.04 DESCRIPTION:

- A. This section of the specification includes the furnishing, installation, and connection of the microprocessor controlled, intelligent reporting evac/fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panel, auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.
- B. The fire alarm system shall comply with requirements of 2022 CFC and DSA Standards for protected premises signaling systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.
- C. The FACP and peripheral initiation devices shall be manufactured 100% by a single manufacturer (or division thereof).
- D. The installing company shall employ only factory-trained technicians on site to install and perform the final checkout and to ensure the systems integrity. No “parts & smarts” installation will be acceptable.

1.05 SCOPE

- A. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.
- B. Basic Performance:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on a two wire Signaling Line Circuit (SLC).
2. Initiation Device Circuits (IDC) shall be a two-wire circuit.
3. Notification Appliance Circuits (NAC) shall be as manufacturers required cabling for speakers, amplifiers and related equipment as required by CBC/CFC 907.
4. Digitized electronic signals shall employ check digits or multiple polling.
5. A single ground or open on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
6. Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.
7. The Alarm System shall perform the following functions:
 - a. Provide automatic fire alarm detection in all building spaces as dictated by local code requirements.
 - b. Provide evacuation signals as dictated by CFC code requirements.
 - c. Provide visible alarms per CFC 907.
 - d. Provide exterior alarm notifications per CFC 907.
 - e. Perform any added functions as specified or required by local codes or AHJ.
 - f. Emergency voice/alarm communications system.

C. Basic System Functional Operation:

1. When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:
 - a. The system alarm LED shall flash.
 - b. A local piezo electric signal in the control panel shall sound.
 - c. An LED display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.

- d. Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.
- e. All system output programs assigned via control-by-event equations to be activated by the particular point in alarm shall be executed and the associated system outputs (alarm Notification appliances and/or relays) shall be activated.

1.06 SUBMITTALS

A. General:

- 1. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
- 2. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Software Modifications: Provide per NFPA 72

- 1. Provide the services of a factory trained and certified authorized technician to perform all system software programming per NFPA 72, 7, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
- 2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modification on site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.
- 3. A copy of the site specific software shall be provided to the client after completion of programming including all passwords. A copy of this program shall be stored on site in non-volatile, non-erasable, non-rewritable memory.

C. Certifications: Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of

the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

- D. Owner's designated representative shall approve all equipment submittals.
- E. In addition to the General requirements, submit all materials for approval arranged in the same order as Specifications, Individually referenced to Specification paragraph and drawing number Submit number required In Division 260000
- F. Progress Schedule: Include duration and milestones for the following:
 - 1. All submittals specified.
 - 2. Shipment to site.
 - 3. Installation.
 - 4. Field testing.
 - 5. Training.
 - 6. First beneficial use date.
- G. Manufacturer's Product Data:
 - 1. List of Materials: For each item, Include:
 - a. Manufacturer.
 - b. Model number.
 - c. Listing: CSFM.
 - d. Quantity.
 - 2. Manufacturer's Product Data: In sequence of List of Materials, Data sheet for each item, including all accessories, marked for proposed product. Photo copies will not be accepted. Original manufacturer specifications sheets only.
- H. Field/Shop Drawings:
 - 1. Resubmit: for coordination reference complete with corrections from previous submittal:

- a. List of Materials.
- b. Manufacturer's Product Data.
- 2. Field (installation) Drawings: Collate in sequence:
 - a. Drawing Index/symbol sheet.
 - b. Floor plans. At scale of Contract Documents. Show:
 - (1) Devices with circuit number.
 - (2) Rough-in.
 - (3) Mounting height.
 - (4) Conduit size.
 - (5) Wire type.
 - (6) Wire fill.
 - c. Sections/Elevations. At scale of Contract Documents.
 - (1) Mounting location reference.
 - d. Mounting details
 - (1) Stamped and signed by Engineer licensed in jurisdiction for work of this type.
 - (2) Show loads, strength of connections, etc.
 - (3) Show calculations - on drawings or in bound volume for review by authorities having jurisdiction.
 - (4) Provide details for:
 - (a) Racks/cabinets/panels
 - e. Installation details as required.
 - (1) Terminal cabinets: terminations.
 - f. Wire run sheets (if used) Show:
 - (1) Wire Number.

- (2) Source.
 - (3) Designation
 - (4) Signal Type.
 - (5) Wire type.
 - (6) Operating level or voltage (if applicable).
3. Shop (Fabrication) Drawings: Collate In sequence:
- a. Drawing Index/symbol sheet (if separate set from Field Drawings).
 - b. System functional drawings. Submit separate drawing for each system/subsystem. Show:
 - (1) Equipment: Function, make, model.
 - (2) Wire number.
 - (3) Wire Type.
 - c. Fabrication details submit for:
 - (1) Receptacles.
 - (2) Panels.
 - (3) Special mounting provisions.
 - (4) Legends/engraving details. Half or full size:
 - (a) Receptacles.
 - (b) Panels.
 - (c) Equipment.
4. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
5. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
6. Show annunciator layout, configurations, and terminations.

- I. Shop and Field Test Reports: Provide per CFC 901.2.1 provisions.
1. Schedule: Submit test reports In timely manner relative to Project schedule such that owner may conduct Verification of submitted Test Data at owner's option, without delay of progress.
 - a. Shop test report: Submit prior to shipping completed system to project site.
 - b. Per CFC 901.2.1. Statement of compliance. Before requesting final approval of the installation, where required by the fire code official, the installing contractor shall furnish a written statement to the fire code official that the subject fire protection system has been installed in accordance with approved plans and has been tested in accordance with the manufacturer's specifications and the appropriate installation standard. Any deviations from the design standards shall be noted and copies of the approvals for such deviations shall be attached to the written statement.
 2. Test Reports: Include:
 - a. Time and date of test.
 - b. Personnel conducting test.
 - c. Test Object.
 - d. Procedure used.
 - e. Test equipment, Including serial and date of calibration.
 - f. Results of test - numerical or graphical presentation.
 3. Verification of Submitted Test Data: owner may elect to verify some or all test data submitted. Contractor to provide statement of compliance per CFC 901.2.1 as required when requesting final test. Retest In presence of designated observer(s) at reasonable convenience of owner. Provide technician familiar with work of this Section. Provide all test equipment.
- J. Reference Data for Operation, Maintenance and Repair
1. In addition to the requirements of Division 1, submit one (1) additional set. Submit in three post binders (not ring binder) with Tabs.
 2. Index.

3. Systems operating Instructions.
 4. Reduced set of system Record Drawings.
 5. Key schedule.
 6. Maintenance and spare parts schedules.
 7. Shop and Field Test Reports.
 8. Equipment manuals. Collate alphabetically by manufacturer. Provide manufacturer's original operation, Instruction and service manuals for each equipment item. For each set, provide manufacturer's original printed copies only. Photocopies not acceptable.
- K. Record Drawings in AutoCAD format
1. Quantity:
 - a. Review sets: as for Shop and Field Drawings.
 - b. Record set:
 - (1) Three (3) full size copies
 - (2) One USB drive with applicable .DWG files
 2. Content: All drawings required under “Field and Shop Drawings”. Show “as Installed” condition.
- L. Other than Specified Equipment
1. Equipment other than specified shall be considered for approval provided the following is submitted in writing by the contractor to the Consultant ten (3) days before the bid date:
 2. Complete lists, descriptions and drawings of materials to be used.
 3. A complete list of current drain requirements during normal supervisory conditions, trouble conditions, and alarm conditions
 4. Battery standby calculations showing total standby power needed to meet the system requirements as specified
- M. Substituted Equipment:

1. If equipment other than that specified is supplied, it shall be the contractor's obligation to submit the appropriate documentation and allow the specifying Consultant sufficient time to consider the equality of the substituted items.

N. Satisfying the Entire Intent of these Specifications

1. It is the contractor's responsibility to meet the entire intent of these specifications. Deviations from the specified items shall be at the risk of the contractor until the date of final acceptance by the Consultant and owner's representative.
2. All costs for removal, relocation, or replacement of a substituted item shall be at the risk of the contractor.

1.07 GUARANTEE/WARRANTY

- A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.08 POST CONTRACT MAINTENANCE:

- A. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.
- B. As part of the submittal, include a quote for a maintenance contract to provide all maintenance, test, and repair described below. Include also a quote of unscheduled maintenance/repair, including hourly rates for technicians trained on this equipment, and response travel costs. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.
- C. Maintenance and testing shall be on a semiannual basis or as required by the AHJ. A preventive maintenance schedule shall be provided by the contractor that shall describe the protocol for preventive maintenance. The schedule shall include:
 1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and all accessories of the fire alarm system.
 2. Each circuit in the fire alarm system shall be tested semiannually.

3. Each smoke detector shall be tested in accordance with the requirements of CFC 907.8.B;907.8.4 CSFM & NFPA Standards.

1.09 POST CONTRACT EXPANSIONS:

- A. The contractor shall provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.
- B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable control modules equal (list actual quantity of each type).
- C. Quotation shall include installation and test labor and labor to reprogram the system for this 10% expansion. If additional FACP hardware would be required, include the material and labor necessary to install this hardware.
- D. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the FACP and at each intelligent addressable device. Do not include cost of conventional peripherals or the cost of initiating devices or Notification appliances connected to the addressable monitor/control modules.
- E. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

1.10 APPLICABLE STANDARDS AND SPECIFICATIONS:

- A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards.
 1. DSA Requirements including all IR documents.
 2. County of Ventura Fire Code
 3. All requirements of the Authority Having Jurisdiction (AHJ).
 4. CFC
 5. NFPA Fire Code

1.11 APPROVALS

- A. The system shall have proper listing and/or approval from internationally recognized agencies.
- B. The system shall be listed by the international agencies as suitable for extinguishing release applications.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIAL

- A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the Fire Alarm Code.
- B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
- C. All Equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.02 CONDUIT AND WIRE

- A. Conduit:
 1. Conduit shall be red & installed in accordance with the DSA & fire marshal requirements.
 2. All wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
 3. Cable must be separated from any open conductors of Power, or Class circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors.
 4. Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

5. Conduits shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
6. Conduit shall be 3/4 inch (19.1 mm) minimum and red in color.

B. Wire:

1. All fire alarm system wiring shall be new.
2. Wiring shall be in accordance with DSA codes and approved by CSFM and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation.
5. Wiring used for the multiplex communication loop shall be twisted and shielded and support a minimum wiring distance of 10,000 feet. The system shall support up to 1,000 ft. of untwisted, unshielded wire. The system shall permit use of IDC and NAC wiring in the same conduit with the communication loop.
6. All field wiring shall be completely supervised.
7. The Fire Alarm Control panel shall be capable of T-Tapping two wire type. Signaling Line Circuits (SLC's) Systems, which do not allow or have restrictions in, for example, the amount of T-Taps, length of T-Taps etc., are not acceptable.
8. All wire/cable used in underground or below grade, applications shall be rated by the manufacturer for the intended use and be gel filled.

C. Terminal Boxes, Junction Boxes and Cabinets:

1. All boxes and cabinets shall be DIN listed for their use and purpose.

D. Initiating circuits shall be arranged to serve like categories (manual, smoke, water flow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

- E. The Fire Alarm Control Panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the Main Power Distribution Panel as FIRE ALARM. Fire Alarm Control Panel Primary Power wiring shall be 12 AWG. The Control Panel Cabinet shall be grounded securely via the power circuit.

2.03 MAIN FIRE ALARM CONTROL PANEL

- A. The FACP shall be an Edwards EST4 and shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, printer, annunciators, and other system controlled devices.
- B. System Capacity and General Operation:
 - 1. The control panel shall provide, or be capable of expansion to 2000 intelligent/addressable devices.
 - 2. The system shall include Form-C alarm and trouble relays rated at a minimum of 2.0 amps @ 30 VDC. It shall also include four Class B (Style Y) programmable Notification Appliance Circuits.
 - 3. The system shall support programmable driven relays.
 - 4. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display, individual, color coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.
 - 5. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the Fire Alarm Control Panel.
 - 6. The FACP shall provide the following features:
 - a. Drift Compensation to extend detector accuracy over life.
 - b. Sensitivity Test
 - c. Maintenance Alert to warn of excessive smoke detector dirt or dust accumulation.
 - d. System Status Reports to display or printer.
 - e. Alarm Verification, with verification counters.

- f. PAS presignal.
- g. Rapid manual station reporting (under 2 seconds).
- h. Non-Alarm points for general (non-fire) control.
- i. Periodic Detector Test, conducted automatically by software.
- j. Pre-alarm for advanced fire warning.
- k. Cross Zoning with the capability of: counting two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.
- l. March time and temporal coding options.
- m. Walk Test, with check for two detectors set to same address.
- n. Security Monitor Points.
- o. Control-By-Time for non-fire operations, with holiday schedules.
- p. Day/Night automatic adjustment of detector sensitivity.
- q. Device Blink Control for sleeping areas.

C. Central Microprocessor:

1. The Microprocessor shall communicate with, monitor, and control all external interfaces with the control panel. It shall include EPROM for system program storage, non-volatile memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.
2. The microprocessor shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Control-by-event equations shall be held in non-volatile programmable memory and shall not be lost even if system primary and secondary power failure occurs.
3. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.

D. Display:

1. The display shall provide all the controls and indicators used by the system operator and may be used to program all system operational parameters.
2. The display shall include status information and custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.
3. The display shall provide an 80-character back-lit alphanumeric Liquid Crystal Display (LCD). It shall also provide Light-Emitting-Diodes (LEDs), that will indicate the status of the following system parameters: AC POWER, SYSTEM ALARM, SYSTEM TROUBLE, SIGNAL SILENCED, SUPERVISORY, and PRE-ALARM.
4. The Display shall provide a key touch key-pad with control capability to command all system functions, entry of alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.
5. The Display shall include the following operator functions: SIGNAL SILENCE, RESET, DRILL, and ACKNOWLEDGE.

E. Signaling Line Circuit (SLC):

1. The SLC interface shall provide power to and communicate with intelligent detectors (Ionization, Photoelectric, or Thermal) and intelligent modules (monitor or control). This shall be accomplished over a single SLC loop and shall be capable of Style 4 or Style 6 wiring.
2. The loop interface shall receive analog information from all intelligent detectors that shall be processed to determine whether normal, alarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.
3. The detector software shall meet all local VDE and VdS requirements and be certified by VdS as a calibrated sensitivity test instrument.
4. The detector software shall allow manual or automatic sensitivity adjustment.

F. Serial Interfaces:

1. An EIA-232 interface between the Fire Alarm Control Panel and Listed Electronic Data Processing (EDP) peripherals shall be provided.
2. The EIA-232 interface shall allow the use of printers, CRT monitors, and PC compatible computers.
3. The EIA-232 interface shall include special protocol methods that allow off-site monitoring of the FACP over standard dial-up phone lines. This ancillary capability shall allow remote readout of all status information, including analog values, and shall not interfere with or degrade FACP operations when used. It shall allow remote FACP Acknowledge, Reset, or Signal Silence in this mode. It shall also allow adjustment of detector sensitivity and readout of the history file.
4. An EIA-485 interface shall be available for the serial connection of remote annunciators and LCD displays.
5. The EIA-485 interface may be used for network connection to a Proprietary Receiving Unit.

G. Enclosures:

1. The control panel shall be housed in a DIN listed cabinet suitable for surface or semi-flush mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
2. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators.

H. All interfaces and associated equipment are to be protected so that they will not be affected by voltage surges or line transients, consistent with DIN standards.

I. An optional module shall be available which provides Form-C relays rated at 5.0. The relays shall track programmable software zones.

J. Power Supply:

1. Per CBC/CFC 907.6.2 the primary Power Supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP and shall be a dedicated lock on breaker source.
2. It shall provide 5.0 amps of usable Notification appliance power, using a switching 24 VDC regulator. A 3.0 amp notification expansion power

supply shall be available for the demanding requirements visual devices, for a total system capacity of 8 amps.

3. It shall provide a battery charger for 30 hours of standby using dual-rate charging techniques for fast battery recharge.
 4. It shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.
 5. It shall be power-limited.
 6. It shall provide optional meters to indicate battery voltage and charging current.
- K. Field Charging Power Supply: The FCPS/RPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.
1. Provide per CFC 604.2.4 on emergency power source with back up power.
 2. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 30 hour standby.
 3. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.
 4. The FCPS shall include an attractive surface mount backbox.
 5. The Field Charging Power Supply shall include the ability to delay the AC fail delay requirements.
 6. The FCPS include power limited circuitry.
- L. Field Wiring Terminal Blocks:
1. For ease of service all panel I/O wiring terminal blocks shall be a removable, plug-in type and have sufficient capacity for 18 to 12 AWG wire. Terminal blocks, which are permanently fixed, are not acceptable.
- M. Operators Controls:
1. Acknowledge Switch:

- a. Activation of the control panel Acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and Trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the 80-character LED display to the next alarm or trouble condition.
 - b. Depression of the Acknowledge switch shall also silence all remote annunciator devices
 2. Signal Silence Switch: Activation of the Signal silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.
 3. System Reset Switch: The system reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.
 - a. Holding the system RESET switch shall perform a lamp test function.
 4. Drill (Evacuate) Switch:
 - a. The drill switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.
- N. Field Programming:
1. The system shall be programmable, configurable and expandable in the field without the need for special tools or electronic equipment and shall not require field replacement of electronic integrated circuits.
 2. All programming may be accomplished through the standard FACP keypad.
 3. All field defined programs shall be stored in non-volatile memory.
 4. The programming function shall be enabled with a password that may be defined specifically for the system when it is installed. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level is used for status level changes such as zone disable or manual

on/off commands. A second (higher-level) is used for actual change of program information.

5. Program edit shall not interfere with normal operation and fire protection. If a fire condition is detected during programming operation, the system shall exit programming and perform fire protection functions as programmed.
6. A special program check function shall be provided to detect common operator errors.
7. An Auto-Program (self-learn) function shall be provided to quickly install initial functions and make the system operational.
8. For flexibility, an off-line programming function, with batch upload/download, shall also be available.

O. Specific System Operations:

1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all analog intelligent smoke detectors in the system from the control panel. Sensitivity range shall be within the allowed window.
2. Alarm Verification: Each intelligent addressable smoke detector in the system shall be independently selected and enabled to be alarm verified. The alarm verification delay shall be programmable from 5 to 30 seconds. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
3. Point Disable: Any device in the system may be enabled or disabled through the system keypad.
4. Point Read: The system shall be able to display or print the following point status diagnostic functions:
 - a. Device status.
 - b. Device types.
 - c. Custom device labels.
 - d. View analog detector values.
 - e. Device zone assignments.

- f. Il program Parameters.
5. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing system status.
 6. System History Recording and Reporting: The Fire Alarm Control Panel shall contain a History Buffer that will be capable of storing up to 800 system alarms/troubles/operator actions. Each of these activation's will be stored and time and date stamped with the actual time of the activation. The contents of the History Buffer may be manually reviewed, one event at a time, or printed in its entirety.
 - a. Although the foreground history buffer may be cleared for user convenience, a background, non-erasable buffer shall be maintained which provides the last 800 system events.
 - b. The History Buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable.
 7. Automatic Detector Maintenance Alert: The Fire Alarm Control Panel shall automatically interrogate each intelligent smoke detector and shall analyze the detector responses over a period of time.
 - a. If any intelligent smoke detector in the system responds with a reading that is below or above normal limits, then the system will enter the Trouble Mode, and the particular detector will be annunciated on the system display, and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
 8. Pre-alarm Function: The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.
 9. Software Zones: The FACP shall provide 99 software zones. All addressable devices may be field programmed to be grouped into software zones for control activation and annunciation purposes.

2.04 SYSTEM COMPONENTS

A. Signaling Devices:

1. STROBES shall be UL 1979 listed (as required by Code):
 - a. Strobes shall be provided as required and indicated on the contract drawings and shall have a flash rate not to exceed 60 times per minute.
 - b. The word "Fire" shall appear on the lens or lens plate.
 - c. Strobes shall be a 15cd, 1Hz minimum for restrooms and 75cd, 1Hz for large rooms (i.e., library, multi-use, meeting, etc.).
 - d. Strobes shall mount to 2 gang box, flush or surface as shown on drawings.
2. SPEAKERS (as required by Code & per CBC/CFC 907.5.2.2 & 907.5.2.2.2):
 - a. Alarm Speakers shall be provided as required and as indicated on the contract drawings.
 - b. Speakers shall mount to a 4 sq. box. for interior use and a cast weatherproof, gasketed box for exterior use.
 - c. Speakers shall be red in color.
 - d. Sound pressure level shall be 85dBA at 10 feet
 - e. Screw terminals shall be provided for field connections.
 - f. Unit may be configured with optional Strobe for interior Horn/Strobe applications.
3. SPEAKER/STROBES (as required by Code):
 - a. Speaker/Strobe combination units shall be supplied as required and as indicated on the contract drawings.
 - b. Strobes shall not to exceed 60 flashes per minute.
 - c. The word "Fire" shall appear on the lens or lens plate.
 - d. Strobes shall be a 15cd, 1Hz minimum restrooms and 75cd, 1Hz for large rooms (i.e., library, multi-use)
 - e. Wiring for Strobes shall be separate from Speaker Circuits. Strobes shall mount to face of Speaker unit.

- f. Wiring for Speakers shall be separate from Strobe Circuits. Horns shall mount to a 4 sq. box. for interior use.
 - g. Speakers shall be red in color.
 - h. Sound pressure level shall be 85dBA at 10 feet
 - i. Screw terminals shall be provided for field connections.
4. MINI-SPEAKERS (as required by Code):
- a. Mini-Speaker units shall be supplied as required and as indicated on the contract drawings.
 - b. Speakers shall mount to a single gang or double gang box for interior use.
 - c. Mini-Speakers shall be red in color.
 - d. Sound pressure level shall be 90dBA at 10 feet
 - e. Screw terminals shall be provided for field connections.
- B. Addressable Devices – General:
- 1. Addressable Devices shall provide an address-setting means using rotary decimal switches.
 - 2. Addressable Devices shall use simple to install and maintain decade (numbered 1 to 10) type address switches. Devices, which use a binary address setting method, such as a dip switch, are not an allowable substitute.
 - 3. Detectors shall be intelligent and addressable, and shall connect with two wires to the Fire Alarm Control Panel Signaling Line Circuits.
 - 4. Addressable smoke and thermal detectors shall provide dual alarm and power LEDs. Both LEDs shall flash under normal conditions indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LEDs shall be optional through the system field program. An output connection shall also be provided in the base to connect an external remote alarm LED.

5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity shall be automatically adjusted by the panel on a time-of-day basis.
6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by DIN, VDE and/or VdS as meeting the calibrated sensitivity test requirements.
7. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. An optional base shall be available with a built-in (local) sounder rated at 85 DBA minimum.
8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

C. Addressable Pull Box (manual station as required by Code):

1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
3. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.

D. Intelligent Photoelectric Smoke Detector where noted on plans and as required per 907.2.24.3:

1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

E. Intelligent Thermal Detectors:

1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.

F. Intelligent Duct Smoke Detector:

1. The in-duct smoke detector housing shall accommodate an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.
2. When sufficient smoke is sensed in the duct, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

G. Addressable Dry Contact Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLC loops, per NFPA Chapter 21 the emergency control functional interface (21.2.4) shall be located within 3 feet of sensor.
2. The monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box.
3. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch x 1-1/4 inch x 1/2 inch. This version need not include Style D or an LED.

H. Two Wire Detector Monitor Module:

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
2. The two-wire monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box or with an optional surface backbox.

3. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

I. Addressable Control Module:

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contact relay.
2. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.
3. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.
4. Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised listed remote power supply.
5. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

J. Waterflow Indicators:

1. Flow switches shall be integral, mechanical, non-coded, non-accumulative retard type.
2. Flow switches shall have an alarm transmission delay time that is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30 to 45 seconds.
3. Flow switches shall be located a minimum of one (1) foot from a fitting that changes the direction of the flow and a minimum of three (3) feet from a valve.

K. Sprinkler and Standpipe Valve Supervisory Switches:

1. Each sprinkler system water supply control valve riser or zone control valve, and each standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.
2. Each Post Indicator Valve (PIV) or main gate valve shall be equipped with a supervisory switch.
3. Mount switch so as not to interfere with the normal operation of the valve and adjust to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.
4. The mechanism shall be contained in a weatherproof aluminum housing that shall provide a 3/4 inch tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.
5. Switch housing to be finished in red baked enamel.
6. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.
7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.

L. LCD Alphanumeric Display Annunciator:

1. The alphanumeric display annunciator shall be a supervised, back-lit LCD display containing a minimum of forty (40) characters for alarm annunciation in clear English text.
2. The LCD annunciator shall display all alarm and trouble conditions in the system.
3. Up to 32 LCD annunciators may be connected to an EIA 485 interface. LCD annunciators shall not reduce the annunciation or point capacity of the system. Each LCD shall include vital system wide functions such as, System Acknowledge, Silence and Reset.
4. LCD display annunciators shall mimic the main control panel 80 character display and shall not require special programming.
5. The LCD annunciator shall have switches that may be programmed for System control such as, Global Acknowledge, Global Signal Silence and

Global System Reset. These switch inputs shall be capable of being disabled permanently or by a key lockout function on the front plate.

2.05 BATTERIES:

- A. Shall be 12 volt, Gell-Cell type (two required) and per NFPA 72, 10.6.10.1.1 shall be noted 2017 November manufacturer date stamp.
- B. Battery shall have sufficient capacity to power the fire alarm system for not less than thirty hours (30) plus thirty minutes (30) of alarm upon a normal AC power failure.
- C. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation shall be in accordance with the VDE, DIN, EN, VdS Standards, along with local codes, as shown on the drawings, and as recommended by the equipment manufacturer.
- B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
- C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

PART 4 - GUARANTEE AND TEST

4.01 GENERAL

- A. The contractor shall guarantee all equipment and wiring free from inherent mechanical and electrical defects for one year from the date of final acceptance by consultant.
- B. Acceptance shall consist of the following:

1. Per CFC 901.2.1. Statement of compliance. Before requesting final approval of the installation, where required by the fire code official, the installing contractor shall furnish a written statement to the fire code official that the subject fire protection system has been installed in accordance with approved plans and has been tested in accordance with the manufacturer's specifications and the appropriate installation standard. Any deviations from the design standards shall be noted and copies of the approvals for such deviations shall be attached to the written statement.
2. Burn-in period.
 - a. The system shall be accepted for start of warranty upon successful completion and testing of AHJ and Consultant.
 - b. Burn-In period shall be a 30 day time frame to allow the system to operate free of defects, grounds, programming faults, etc.
 - c. The 30 day Burn-In shall begin the day of acceptance by AHJ.
 - d. The Burn-In period shall be 30 days of continuous use without system trouble, false alarm, open, short or ground condition present.
 - e. Should the system fail for any reason during the burn-in period, the contractor shall respond immediately upon notification by owner's personnel and correct said deficiencies.
 - f. Upon correction and restoration, the "Burn-In" period shall be re-set to "0" and the 30 day count shall begin again.
 - g. Start of Warranty shall commence upon day 31 of successful "Burn-In" period.

4.02 FINAL TEST (as applicable for project devices)

- A. Per CFC 901.2.1. Statement of compliance. Before requesting final approval of the installation, where required by the fire code official, the installing contractor shall furnish a written statement to the fire code official that the subject fire protection system has been installed in accordance with approved plans and has been tested in accordance with the manufacturer's specifications and the appropriate installation standard. Any deviations from the design standards shall be noted and copies of the approvals for such deviations shall be attached to the written statement.
- B. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically

supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with VDE, VdS and DIN Standards.

- C. Part of burn in period to be done prior to final test complete items 1 thru 11.
1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
 2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
 3. Verify activation of all flow switches.
 4. Open initiating device circuits and verify that the trouble signal actuates.
 5. Open and short signaling line circuits and verify that the trouble signal actuates.
 6. Open and short Notification Appliance Circuits and verify that trouble signal actuates.
 7. Ground all circuits and verify response of trouble signals.
 8. Check presence and audibility of tone at all alarm notification devices.
 9. Check installation, supervision, and operation of all intelligent smoke detectors using the Walk Test.
 10. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
 11. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.
- D. Before the installation shall be considered completed and acceptable by the awarding authority, a test on the system shall be performed as follows:
1. The contractor's job foreman, in the presence of a representative of the manufacturer, a representative of the owner, the inspector of record (IOR) and the fire department shall operate every building fire alarm device to ensure proper operation and correct annunciation at the control panel.

2. Audibility tests shall be performed utilizing a calibrated Decibel Meter. The system shall be capable of supplying 15dB over ambient noise levels. Tests shall be conducted in the presence of the Consultant and AHJ at selected locations by Consultant/AHJ. Prior to acceptance, testing the contractor shall have verified signal levels in each area as to meeting the above criteria.
3. Where application of heat would destroy any detector, it may be manually activated.
4. The initiation circuits and the indicating appliance circuits shall be opened in at least two (2) locations per zone to check for the presence of correct supervisory circuitry.
5. When the testing has been completed to the satisfaction of both the contractor's job foreman and the representatives of the manufacturer and owner, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to the owner and the fire department.
6. The contractor shall leave the fire alarm system in proper working order, and, without additional expense to the owner, shall replace any defective materials or equipment provided by him under this contract within one year (365 days) from the date of final acceptance and successful burn in period.
7. Prior to final test, the fire department must be notified in accordance with local requirements.
8. Submit completed Certification form. The form shall be submitted in type written format. Hand written forms will not be accepted.

4.03 AS-BUILT DRAWINGS, TESTING, AND MAINTENANCE INSTRUCTIONS

- A. Per CFC 901.5.2; 901.6.2.1, a complete set of reproducible "as-built" drawings in AutoCAD R2015 format (CDs and sheets) showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of system acceptance. Records to be retained a minimum of 5 years on premises per Title 19.
- B. Operating and Instruction Manuals:
 1. Operating and instruction manuals shall be submitted prior to testing of the system. Four (4) complete sets of operating and instruction manuals shall be delivered to the owner upon completion.

2. The owner shall be furnished with all programming disks for each installation as well as hard copy printouts. Provide necessary training and/or schooling to designated owner personnel at no additional cost to owner. Training shall be at the owner's designated location, by factory trained personnel. Provide all necessary interconnection cables for remote programming via "laptop" computer.

C. Testing Frequency Instructions:

1. Complete, accurate, step-by-step testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, and a complete trouble-shooting manual explaining how to test the primary internal parts of each piece of equipment shall be delivered to the owner upon completion of the system.

D. Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:

1. Instruction on replacing any components of the system, including internal parts.
2. Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions
3. A complete list of all equipment and components with information as to the address and phone number of both the manufacturer and local supplier of each item.
4. User operating instructions, shall be provided prominently displayed on a separate sheet located next to the control unit.
5. Administrative staff of the school shall be thoroughly instructed in the use of system by authorized distributor. Such service shall be provided in conjunction with the Fire Alarm equipment.
6. Staff of the Park as well as owner maintenance staff shall be thoroughly instructed in the use of the System. Training shall include a minimum of three (1) hour sessions, to be scheduled at the Owner's designated time.
7. Maintenance instruction shall be performed in the same manner as described above. Training shall include a minimum of three (1) hour sessions, to be scheduled at the owner's designated time.

END OF SECTION

SECTION 26 4745

NETWORKING & DATA COMMUNICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. SCOPE

1. This section outlines the requirements for the Local Area Networks system switches, system hubs, networking modules (transceivers) and connectivity at the various IDF's throughout the owner's facility.
2. Administrative Network
 - a. The Network distribution components will be located in telecom room IDF and in various communications rooms throughout the facility. The system is connected via OPTICAL FIBER, CAT 5e, or 6e cabling to various server and workstation locations throughout the building.
 - b. Administrative Network nodes are located throughout the building.
 - c. The contractor will be responsible to install, program, test and document the system as installed, verifying throughput rates.
 - d. The contractor will be required to work in close coordination with the owner's IT information systems director and staff.

1.02 WORK INCLUDED

- A. Furnish and install all required system switches, system hubs, system 100/1000BASE-T modules, transceivers, patch cables and accessories for a complete system.
- B. The installation shall include interconnect/patching equipment (fiber and copper), jumpers (optical fiber and twisted-pair copper), hub & switch equipment, optical fiber transceivers, routers, asynchronous controllers, optical fiber transceivers, and any other equipment enumerated within. In addition to material and equipment, contractor shall provide labor and any incidental material required for installation. All active equipment shall be installed and connected to the cable system.
- C. Configuration, programming and testing of the local area networks.

- D. New local area network locations are listed on the drawings.

1.03 RELATED DOCUMENTS

- A. SECTION 260000 - GENERAL ELECTRICAL CONDITIONS;
- B. SECTION 264750 - CABLING & DISTRIBUTION SYSTEMS

1.04 FUNCTIONAL REQUIREMENTS

- A. Transmission Media. The example LAN will use both twisted-pair and fiber optic cable plant to provide connectivity between user workstations located in offices and network resources located in the facility computer room(s).
- B. Host/Server Access. The network will allow users to access all host/server resources, including future application servers, such as additional database servers. There should be full compatibility with existing initiatives (e.g., a new financial system, security system, and telephone and employee services database repository).
- C. Environment/Facility Considerations. The network architecture design must take into account existing space, power, and heat constraints.
- D. Flexible Architecture. The design must have sufficient flexibility to permit grouping users into distinct "workgroups" for office automation services. Physical features, such as a layered distribution scheme, redundant patching, and real-time configuration and topology modifications, will be included in the design. The overall transition strategy should minimize downtime and denial of service.

1.05 OPERATIONAL REQUIREMENTS

- A. Network Management. The design will contain methods and tools for the efficient management and control of the network. The capability to monitor and manage both network traffic and physical components of the network will be provided.

1.06 PERFORMANCE REQUIREMENTS

- A. Network Response. The servers and other components of the network must be sized to avoid unacceptable start-up delays when workstations are first activated, long login times, and slow response during normal network utilization (e.g., application startup and exit, file retrieval and save operations). Response times for network desktop applications should not be significantly greater than stand-alone usage.

- B. Network Availability. The users must be able to access the network 24 hours a day, seven days a week unless specifically made unavailable at organization discretion(e.g., for administrative or maintenance activities).

1.07 NETWORK CAPACITY: Individual components of the network will be sized as indicated below:

- A. The cable plant -- The cable plant will provide for approximately 150 cable drops distributed throughout the offices and facility.
- B. User workstations -- Initially, service will be provided for approximately 50 local users. However, when fully operational, the network will be capable of supporting approximately 150+ local users
- C. Intelligent hub equipment -- All hub equipment will be sized to support all ports plus 25% spare ports for growth.

1.08 REFERENCES AND STANDARDS INCORPORATED

- A. Published specifications, standards, tests or recommended methods of trade, industry or government organizations apply to work of this section where cited by abbreviation noted below:
 1. EIA Electrical Industries Association
 2. IEEE Institution of Electrical and Electronics Engineers
 3. ISO International Standards Organization
 4. ITU International Telecommunications Union
 5. CCITT Consultative Committee of International Telegraph and Telephone
 6. ANSI American National Standards Institute
 7. TIA Telecommunications Industry Association
 8. ASTM American Society for Testing and Materials
 9. NEC National Electric Code
 10. FCC Federal Communications Commission
 11. CEA Insulated Cable Engineers Association, Inc.
 12. IEC International Electrotechnical Commission
 13. NEMA National Electrical Manufacturers Association

14. UL Underwriters' Laboratories, Inc.
 15. IPC The Institute for Interconnecting and Packaging Electronic Circuits
 16. NFPA National Fire Protection Association
 17. BICSI Building Industry Consulting Service International
- B. Nothing in the drawings, details, or specifications shall be construed to permit work not conforming to applicable laws, ordinances, rules, or regulations and standard industry IEEE 802 Ethernet standards.
- C. It is not the intent of the drawings, details, or specifications to repeat requirements of codes except where necessary for completeness or clarity.

1.09 SUBMITTALS

- A. Submit manufacturer's data literature for each item used describing each product, including specification, installation instructions and general recommendations.
- B. Submit manufacture's data literature on system hubs, switches, 100/1000BASE-T modules, 100/1000BASE-FB modules, 100/1000Base2 modules, power supplies and accessories.
- C. As per section 260000 - General drawings, submittals and shop drawings.
- D. Progress Schedule: Include duration and milestones for the following:
1. All submittals specified.
 2. Completion of equipment buyout.
 3. Completion of equipment receipt at fabrication shop.
 4. Shop fabrication.
 5. Shop testing.
 6. Shipment to site.
 7. Installation.
 8. Field testing.
 9. Training.
 10. First use date.

E. Manufacturer's Product Data:

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ALTERATION TO STUDENT SERVICES ANNEX (A#33484) NEXT-UP
VENTURA COUNTY COMMUNITY COLLEGE DISTRICT

1. List of Materials: For each item include:
 - a. Manufacturer.
 - b. Model number.
 - c. Listing: UL, City Lab or none.
 - d. Quantity.
 2. Manufacturer's Product Data: In sequence of list of materials, data sheet for each item, including all accessories, marked for proposed product.
- F. Field and Shop Drawings:
1. Resubmit: for coordination reference complete with corrections from previous submittal:
 - a. List of Materials.
 - b. Manufacturer's Product Data.
 2. Field (installation) Drawings: collate in sequence:
 - a. Drawing index/symbol sheet.
 - b. Floor plans. At scale of contract documents. Show:
 - (1) Devices with circuit number.
 - (2) Rough-in.
 - (3) Mounting height.
 - (4) Conduit size.
 - (5) Wire type.
 - (6) Wire fill.
 - c. Sections/Elevations. At scale of contract documents.
 - (1) Mounting Location Reference
 - d. Enlarged Plans. At scale of contract documents or larger as required for trade coordination. Show:
 - (1) Refer to floor plans.
 - (2) Architectural features.

- (3) Rack cabinets.
- (4) System furniture.
- (5) Clearances.
- e. System conduit riser drawing, show:
 - (1) Terminal cabinets.
 - (2) Coordination with floor plans.
 - (3) Wire runs not shown on floor plans.
 - (4) Wire type.
 - (5) Wire fill.
- f. Mounting details
 - (1) Stamped and signed by engineer licensed in jurisdiction for work of this type.
 - (2) Show loads, strength of connections, etc.
 - (3) Show calculations - on drawings or in bound volume for review by authorities having jurisdiction.
 - (4) Provide details for:
 - (a) Racks.
 - (5) Installation details as required.
 - (6) Terminal cabinets: terminations.
- g. Wire run sheets (if used) show:
 - (1) Wire number.
 - (2) Source.
 - (3) Designation.
 - (4) Signal type.
 - (5) Wire type.
 - (6) Operating level or voltage (if applies).
- h. Shop and Field Test Reports

3. Schedule: Submit test reports in timely manner relative to project schedule such that owner may conduct verification of submitted test data at owner's option, without delay of progress.
 - a. Shop test report: Submit prior to shipping completed system to project site.
 - b. Field test report: Submit following system completion and prior to and as condition precedent to owner's acceptance of the work of this section.
4. Test Reports: Include:
 - a. Time and date of test.
 - b. Personnel conducting test.
 - c. Test object.
 - d. Procedure used.
 - e. Test equipment, including serial and date of calibration.
 - f. Results of test - numerical or graphical presentation.
5. Verification of submitted test data: Owner may elect to verify some or all test data submitted. Retest in presence of designated observer(s) at reasonable convenience of owner. Provide technician familiar with work of this section. Provide all test equipment.

G. Record Drawings in AutoCAD format

1. Quantity:
 - a. Review sets: as for shop and field drawings.
 - b. Record set:
 - (1) Three (3) hard copies
 - (2) One USB drive with applicable .DWG files as full scale
 - c. Content: All drawings required under "Field and Shop Drawings". Show as installed condition.

PART 2 - PRODUCTS

2.01 GENERAL

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VENTURA COUNTY COMMUNITY COLLEGE DISTRICT

NETWORKING AND DATA COMMUNICATIONS

26 4745-7

- A. Quality of Products: Material and equipment specified herein have been selected as the basis of acceptable and desired quality of performance and have been coordinated to function as components of the specified system. Where a particular material, device, piece of equipment of system is specified directly, the current manufacturer's specification for the same shall be considered to be part of these specifications, as if completely contained herein in every detail. Each material, device, or piece of equipment provided hereunder shall comply with all of the manufacturer's published specifications for that item.
- B. Quantity: Provide quantity as shown on contract drawings, the schedule or as otherwise defined herein.
- C. Preference: Owner desires system to be furnished and installed as specified herein.
- D. Substitutions: Comply with SECTION 260000 -GENERAL CONDITIONS.
- E. Provide complete: Provide all auxiliary and incidental materials and equipment necessary for the operation and protection of the work of this section at, if specified in full herein.
- F. Provide new: All materials provided under the work of this section shall be new, shall be the manufacturer's latest design/model, and shall be permanently labeled with the manufacturer's name, model number and serial number.
- G. Similar: Similar devices shall be of the same manufacturer, unless specifically noted otherwise in these specifications.
- H. Continuous Use: All active circuitry shall be solid state and shall be rated for continuous use. All circuit components shall be operated in full compliance with the manufacturer's recommendations and shall contain sufficient permanent identification to facilitate replacement.

2.02 MANUFACTURERS

A. NETWORKING HARDWARE

- 1. System design is based on products as manufactured by Cisco, Bertec Substitutions must be pre-approved according to Sectin 16010 and general conditions.

B. SYSTEM SPECIFICATIONS

1. LOCAL AREA NETWORK

- a. The Local Area Network shall be based on and support IEEE802 functional standards for EtherNet Local Area Networking.

- b. The main distribution frame (MDF) and all intermediate distribution frames (IDF's) shall support one EtherNet segment per network.
- c. System shall be sufficient to support use at full capacity without user-perceptible delays in network response time.
- d. System shall be sufficient to support any combination of system features at full capacity. System shall allow reconfiguration of backbone to allow Customer maximum flexibility and implementation of options in case of need when future services are identified and added.

C. LAN CONFIGURATION

- 1. System hubs are required in DESIGNATED zones so that every data drop on site can be serviced by a hub.
- 2. Each system hub shall allow for growth, without the need to add an additional hubs to 125% of the current data drop count for the area of the campus that it serves even though all those drops will not be connected at initial installation.
- 3. Each designated location shall utilize a system hub as per the specification.
- 4. Each hub location shall utilize fiber optic transceiver module for connection to the fiber optic backbone or horizontal distribution (where fiber is utilized as the backbone or horizontal media).
- 5. The initially active 100/1000BASE-T, 100/1000BASE-T locations shall be connected to the system Hubs via CAT 6 UTP patch cords and patch panels. If Telco style 100/1000BASE-T modules are utilized in the system Hub then CAT 6, Telco-to RJ45 patch panels shall be installed with the appropriate cable to the hub for full connectivity.

2.03 MATERIALS AND EQUIPMENT

A. SYSTEM HUBS

- 1. The Local Area Network shall be created from a family of intelligent, or "smart," switches, hubs and related products. The product family shall consist of various hubs; numerous plug-in EtherNet, FDDI, and internetworking modules for these hubs, and network management software. These products shall enable the customer to create a large-scale facility network that is flexible, reliable, and manageable.

2. The System shall have port switching technology that shall offer remote network configuration and management capabilities.
3. The System's network management shall support network analysis, identify specific network problems, and correct or self-heal problems dynamically. The system's network management shall not be a passive traffic monitoring tool.
4. System hubs shall have the following parameters and features:
 - a. Modular Multi-Media Chassis.
 - b. Supports SNMP Based Network Management System.
 - c. Supports Inband and Out of Band Network Management.
5. Specific EtherNet features required:
 - a. Supports Shielded/Unshielded Twisted Pair, Coax, AUI & Synchronous Fiber.
 - b. Supports Internal EtherNet Terminal Servers for TCP/IP.
 - c. Supports Fiber Links Up to 2.0 Kilometers.
6. System hub shall be provided in 12, 24, or 48 port versions. The system hub shall be able to be mounted in a rack and installed from the front.
7. Transceiver slots for connection of twisted pair 100/1000Base-T, Thin LAN or fiber optic FIORL.
8. The unit shall include and Intel I960 RISC-based processor, 1 Mbytes of RAM and 256Kbytes of flash EEPROM.
9. Complete workgroup security including: intruder prevention, auto port disabling, network management alarm, leaves drop prevention, authorized managers list and password protection.
10. Provisions for added SNMP management module.
11. Intelligent error monitoring, intelligent segmentation recovery, auto-segmentation, fault isolation and integrity.
12. Support for SNMP/IP and IPX multi-vendor management with SNMP browsers.
13. The unit shall be UL rated and meet FCC Part 15 Class A emissions standards.

14. The unit shall be provided with a lifetime limited, 5 year on site warranty.
 15. The system hub must be capable of implementation to include all of the following features:
 - a. The FOIRL module shall achieve point-to-point connections longer than the 1 kilometer specified by the IEEE FOIRL specification by use of high power optics.
 - b. A FOIRL transceiver shall be available to link a network station to EtherNet 100/1000BASE-FL LANs using fiber-optic cable. The FOIRL transceiver shall attach directly to the AUI port on the network station eliminating the need for an AUI cable.
 16. An EtherNet transceiver module shall be available to provide AUI connectivity to the system hubs.
 17. An EtherNet BNC module shall be available to provide a single connection to thin-wire EtherNet segments up to 185 meters in length.
- B. Approved Suppliers
1. The following vendors have been pre-approved to supply product under this contract:
 - a. Cisco
 - b. 3Com
 - c. Others submit in accordance with substitution requirements.

PART 3 - EXECUTION

3.01 GENERAL

- A. Provide installation logs supporting building infrastructure.
- B. Configure and cross connect all ports as required for complete end to end system.

3.02 DRAWING DETAILS (Shop Drawings)

- A. Show wall elevation and wire details on shop drawings. Show equipment function, make and model and wire routing and terminations within rack or cabinet.
- B. Show as-built location of all devices on shop drawings.

- C. Provide 3 sets of bound operation and maintenance manuals, including submittal materials, and record of field changes. Provide complete as-built wiring diagrams in AutoCAD2000 format. Provide CD files and original tracings (E size) in format of construction drawings. Input all cabling information into ACS system and provide a detailed printed report with as-builts.

3.03 QUALITY CONTROL

A. Evidence of Experience and Qualifications

1. Show that the contractor who will perform the work has a minimum of 5 years of experience successfully installing system of the same type and design as specified herein. Include the names, locations, and points of contact of at least two similar installations of the same type and design as specified herein where the installer has installed such systems. Indicate the type of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 12 months.
2. Show that the instructor, who will train staff, operating and maintenance personnel, has received a minimum of a CNE/MCE training from a factory training center, and 2 years' experience in the installation of systems of the type specified. Submit training certification in equipment submittals, title section training and certifications.

3.04 TESTING

A. GENERAL

1. Testing shall be performed in the presence of the owner.
 - a. Testing shall include verification of:
 - (1) Server operation and configuration
 - (2) NOS installation, configuration and operation
 - (3) HUB insulation and operation
 - (4) Cable Plant
2. All test equipment shall bear current calibration stickers or dated certificates.
3. Printed test results along with as-built drawings shall be assembled into a 3 ring project binder and delivered to the consultant for verification and final acceptance prior to start of warranty.

3.05 COMMISSIONING

A. General

1. The contractor shall guarantee all equipment and wiring free from inherent mechanical and electrical defects for one year from the date of final acceptance by owner.
2. Acceptance shall consist of the following:
 - a. Burn-in period.
 - (1) The system shall be accepted for start of warranty upon successful completion and testing of the system.
 - (2) Burn-in period shall be a 30 day time frame to allow the system to operate free of defects, grounds, programming faults, etcetera.
 - (3) The 30-day burn-in shall begin the day of acceptance by owner.
 - (4) The burn-in period shall be 30 days of continuous use without system trouble, false alarm, open, short or ground condition present.
 - (5) Should the system fail for any reason during the burn-in period, the contractor shall respond immediately upon notification by owner's personnel and correct said deficiencies.
 - (6) Upon correction and restoration, the burn-in period shall be re-set to "0" and the 30 day count shall begin again.
 - (7) Warranty shall commence upon day 31 of successful burn-in period.
 - b. Final Test
 - (1) Before the installation shall be considered completed and acceptable by the awarding authority, a test on the system shall be performed as follows:
 - (a) The contractor's job foreman, in the presence of a representative of the manufacturer, and a representative of the owner shall operate every network device to ensure proper operation and correct configuration at the file server location.
 - (b) When the testing has been completed to the satisfaction of both the contractor's job foreman and the representatives of the manufacturer and owner, a

notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to the owner.

- (c) The contractor shall leave the data network system in proper working order, and, without additional expense to the owner, shall replace any defective materials or equipment provided by him under this contract within one year (365 days) from the date of final acceptance by the consultant.

B. As Built Drawings, Testing, and Maintenance Instructions

1. A complete set of reproducible as-built drawings in AutoCAD R2000 format (CDs and sheets) showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of system acceptance.
2. Operating and Instruction Manuals
 - a. Operating and instruction manuals shall be submitted prior to testing of the system. Four (4) complete sets of operating and instruction manuals shall be delivered to the owner upon completion.
 - b. Provide necessary training and/or schooling to designated owner personnel at no additional cost to owner. Training shall be on site.

C. Testing Frequency Instructions

1. Complete, accurate, step-by-step testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, and a complete trouble-shooting manual explaining how to test the primary internal parts of each piece of equipment shall be delivered to the owner upon completion of the system.
2. Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:
 - a. Instructions on replacing any components of the system, including internal parts.
 - b. Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions

- c. A complete list of all equipment and components with information as to the address and phone number of both the manufacturer and local supplier of each item.
- d. User operating instructions shall be provided, prominently displayed on a separate sheet located next to the control.

END OF SECTION

SECTION 26 4901
GENERAL CONTROL DEVICES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Pushbutton and selector switches.
 - 2. Control stations.
 - 3. Relays.
 - 4. Time delay relays.
 - 5. Control power transformers.
 - 6. Control panels.

1.02 REFERENCES

- A. NEMA ICS 1 General Standards for Industrial Control Systems.
- B. NEMA ICS 2 Standards for Industrial Control Devices, Controllers and Assemblies.
- C. NEMA ICS 6 Enclosures for Industrial Controls and Systems.
- D. NEMA ST 1 Standard for Specialty Transformers (Except General Purpose Type).
- E. NFPA 70 - National Electrical Code.

1.03 SUBMITTALS

- A. Submit under provisions of Section 260000
- B. Shop Drawings: Submit to NEMA ICS 1 indicating control panel layouts, wiring connections and diagrams, dimensions, support points.
- C. Product Data: Provide for each component showing electrical characteristics and connection requirements.

- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.04 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of project.

1.05 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 - PRODUCTS

2.01 MATERIAL AND FABRICATION

- A. Contactors:
 1. Mechanically and Electrically Held Contactors: Open type, 120V coil, number of poles and ampere rating as indicated. Factory wired and installed in lighting panelboard compartment.
 2. Square D Co. Class 8903.
- B. Time Switch:
 1. Intermatic time switch as shown on the drawings.
- C. Photo Control With Time Delay:
 1. Rated for 1000W load or 1800 VA, sp st, in weatherproof enclosure.
 2. General Electric Co. Cat. No. CR174H651, or equal.
- D. Control Relays:
 1. 120 VAC coil, 10A rated contacts with number of poles indicated. Square D Co. Class 8501 Type X.
 2. 48 VDC coil, 10A rated contacts. Square D Co. Class 8501 Type KDP 12.

3. 24 VDC coil, 10A rated contacts, plug in Type 3PDT. Square D Co. Class 8501 Type KDP 13 with NR62 socket.
 4. Pneumatic Time Delay Relay: Square D Co. Class 9050 Type B.
- E. Control Units, Such as Push Buttons, Pilot Lights, Selector Switches: Heavy duty, oil tight - Square D Co. Class 9001.
1. Push buttons, standard, full guard. Red for stop, green for start.
 2. Pilot lights, transformer type, with color caps as indicated.
 3. Selector switches, 3 position (Hand Off Automatic) manual return.
 4. Legend Plates: Standard, with legends as indicated.

2.02 LABELING AND IDENTIFICATION

- A. Provide engraved plastic nameplates with 1/4 inch minimum height letters indicating circuit designation of panel or device controlled on controls which are individually enclosed.
- B. Secure nameplates with at least two screws or rivets. Cementing and adhesive installation not acceptable.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section requires the selective removal and subsequent off-site disposal of the following:
 - 1. Removal and disposal of all abandoned pipe and conduit except for pipe or conduit indicated specifically on plans for abandonment in place.
 - 2. Removal and offsite disposal of grass and root mat.
 - 3. Demolition of asphalt concrete and pavements as indicated on the drawings to straight, neatly saw cut surface.
 - 4. Trees as indicated on plans, completed including roots.
 - 5. All other removals which may or may not been shown on plans as required for the project construction.

1.02 SITE CONDITIONS

- A. Protections: Contractor shall provide temporary barricades and other forms of protection to protect general public from injury due to demolition work.
- B. Traffic: Conduct demolition operations and debris removal to ensure minimum interference with roads, streets, walks, bike paths, and other adjacent occupied or used facilities. Access must be coordinated with District's Representative.
- C. Utility Services: Maintain all existing utilities to remain in service and protect them against damage during demolition operations.
- D. Environmental Controls: Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Comply with governing regulations and County Air Pollution Control District pertaining to environmental protection. Do not use water when it may create hazardous or objectionable conditions such as flooding and pollution.

1.03 REFERENCES

- A. Standard Specifications for Public Works Construction (Green Book), latest edition.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.01 DEMOLITION

- A. General: Perform demolition work in a systematic manner. Use such methods as required to complete work indicated on drawings in accordance with governing regulations.
- B. Provide services for effective air and water pollution controls as required by County Air Pollution Control District regulations.
- C. Prior to commencing grading operations, soil containing debris, organics, pavement, or other unsuitable materials, shall be stripped from the foundation and pavement areas. Demolition areas shall be cleared of old foundations, slabs, abandoned utilities, tree roots, and soil disturbed during the demolition process. Depressions or disturbed areas left from the removal of such material shall be replaced with compacted fill under observation by the Geotechnical representative.
- D. Concrete sidewalks will be removed to the nearest construction or expansion joint to the limits of removal as shown on the plans. Exact locations will be determined in the field by the District's Representative.

3.02 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove from Project site debris, rubbish, and other materials resulting from demolition operations. Transport and legally dispose of off site.
- B. If hazardous materials are encountered during demolition operations, contact District's Representative.
- C. Burning of removed materials is not permitted on project site.

3.03 HAZARDOUS MATERIALS

- A. Except as otherwise specified, in the event Contractor encounters on the Project site material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), or other hazardous materials which have not been rendered harmless, Contractor shall immediately stop Work in the area affected and report the condition to the District's Representative in writing. The Work in the affected area shall not thereafter be resumed except by written agreement of the Contractor if in fact the material is asbestos, PCB, or other hazardous materials and has not been rendered harmless. The Work in the affected area shall be resumed in the absence of asbestos, PCB, or other hazardous materials, or when such materials have been rendered harmless.

- B. Construction involving asbestos cement (transite) pipe shall be performed by qualified personnel in accordance with the standards and specifications set forth by American Water Works Association (AWWA), the Occupational Safety and Health Act (OSHA) and the Environmental Protection Agency (EPA), as well as location jurisdictional codes.

3.04 CLEANUP AND REPAIR

- A. General: Upon completion of demolition work, remove tools, equipment and demolished materials from site.
 - 1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to existing condition prior to start of operations. Repair adjacent construction or surfaces soiled or damaged by demolition work.

END OF SECTION

SECTION 31 20 00

EARTHWORK

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes: Excavation, Compaction and Fill.

1.02 REFERENCE

- A. Standard Specifications for Public Works Construction (SSPWC), latest edition.

1.03 QUALITY ASSURANCE

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

1. Standard Specifications for Public Works Construction (SSPWC), latest edition.
2. CAL/OSHA Construction Safety Order Requirements.

- B. Soil Testing Service

1. The District will engage a soil testing service to include testing soil materials proposed for use in the Work and for quality control testing during grading operations.
2. Samples of materials shall be furnished to the testing service by the Contractor at least one week before their anticipated use.
3. Work for this Section includes smoothing out areas for density tests and otherwise facilitate testing work, as directed.
4. Shoring Systems: Pre-engineered systems, clearly labeled as such, may be used.

1.04 PROJECT CONDITIONS

- A. The Contractor shall visit the site and familiarize himself with existing site conditions.
- B. Additional test borings and other exploratory operations may be made by the Contractor at no cost or liability to the District.
- C. Existing Utilities:

1. Where uncharted or incorrectly charted piping or other utilities are encountered during excavation, consult District 's Representative immediately for directions. Cooperate with the District's Representative in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of the District's Representative at no cost to the District. Disturbed trench sections shall be replaced in kind.
- D. Protection of Subgrade: Do not allow equipment to pump, rut, or disturb subgrade, stripped areas, or other areas prepared for Project.
- E. Contractor shall implement measures to prevent soil erosion, and where possible, sediment shall be retained onsite.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.01 SITE PREPARATION

A. General:

1. Remove vegetation, improvements, or obstructions interfering with installation of new construction. Transport and legally dispose of off site. Removal includes stumps and roots. Contractor shall utilize the best construction method to minimize the erosive effect from the removal of site vegetation.
2. Carefully and cleanly cut roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction. Paint cuts over one inch in size with tree pruning compound. Care shall be taken so as not to scar any area of the tree's bark.
3. In order to protect from sediment transfer or contamination from urban run-off during construction, the following grading and erosion control practices shall be followed:
 - a. If grading occurs during the rainy season (November through April), sediment traps, barriers, covers or other methods shall be used to reduce erosion and sedimentation.
 - b. Excavated materials shall not be deposited or stored where the material can be washed away by high water or storm run-off.
 - c. Grading operations on site shall be conducted so as to prevent damaging effects of sediment production and dust on the site and on adjoining properties.

- d. When vegetation has to be removed on site, the methods shall be one that minimizes the erosive effects from the removal.
- e. Exposure of soil to erosion by removing vegetation shall be limited to the area required for construction operations. The construction area shall be fenced to define the project.
- f. Temporary mulching, seeding, or other suitable stabilization shall be used to protect areas during construction or other land disturbance activities on site.
- g. Topsoil, removed from the surface in preparation for grading and construction activities on Campus is to be stored on or near the site and protected from erosion while grading operations are underway, provided that such storage may not be located where it would cause suffocation of root systems of trees to be preserved. After completion of such grading, topsoil is to be restored to exposed cut and fill embankments of building pads so as to provide a suitable base of seeding and planting.
- h. Sediment basins, sediment traps, or similar control measures shall be installed before extensive clearing and grading operations begin for site development.
- i. Water or dust palliatives shall be applied to exposed earth services as necessary to control dust emissions.
- j. Revegetation or stabilization of exposed earth surfaces shall take place as soon as possible.

B. Removals

- 1. Clear the site of trees, shrubs, and other vegetation, which is indicated to be removed.
- 2. Completely remove stumps, roots, and other debris to avoid problems with future utilities.
- 3. Use only hand methods for grubbing inside the drip line of trees indicated to be left standing.
- 4. Existing fills, soil containing debris, organics, pavement, or other unsuitable materials shall be excavated and removed prior to commencing grading operations. Demolition areas shall be cleared of old foundations, slabs, abandoned utilities, landscaping, and soils disturbed during the demolition process. Depressions or disturbed areas left from the removal of such material shall be replaced with compacted fill.

5. The limits and depths for removal of existing fill materials shall be evaluated by project soils engineer during grading.
6. Revegetation or stabilization of exposed earth surface shall take place as soon as possible.

C. Removal of Improvements

1. Remove above-grade and below-grade improvements necessary to permit construction and other work as indicated.
2. Remove from site and legally dispose of off-site, existing fill materials, soil debris, or other unsuitable materials prior to commencing grading operations.

3.02 EXCAVATION

- A. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations and grades as shown, within a tolerance of plus or minus 0.04 foot.
- B. Excavation for Planting Areas: Conform to cross-sections, elevations and dimensions shown, within a tolerance of plus or minus 0.10 foot.

3.03 COMPACTION

- A. General: Control soil compaction during construction providing minimum percentage of density specified on plans.
- B. Percentage of Maximum Density Requirements: Compact soil to not less than the percentages of maximum dry density specified in the plans and in accordance with ASTM D1557-91 method of compaction.
- C. Moisture Control:
 1. When moisture content of exposed scarified soil and/or fill material is below that sufficient to achieve recommended compaction, water shall be added to the soil and/or fill. While water is being added, soil shall be bladed and mixed to provide relatively uniform moisture content throughout the material.
 2. When moisture content of exposed scarified soil and/or fill material is excessive, material shall be aerated by blading or other methods. Fill placed in pavement areas shall be compacted at near optimum moisture content. Jetting is not permitted for compaction.

3.04 FILL

- A. In all excavations, use satisfactory excavated or borrow material sampled and tested by the District 's Testing Laboratory.
- B. Fill excavations as promptly as Work permits, but not until completion of the following:
 - 1. Acceptance by District's Representative of construction below finish grade including, where applicable, waterproofing, damp-proofing, and drainage pipe.
 - 2. Examination, testing, approval and recording locations of underground utilities.
 - 3. Removal of concrete formwork.
 - 4. Removal of shoring and bracing and backfilling of voids with satisfactory materials.
 - 5. Removal of trash and debris.
 - 6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
 - 7. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- C. Continual dust control, as required by the District, and in accordance with County Air Pollution Control District's Standards shall be required for the project construction.

3.05 GRADING

- A. General: To provide support for building floor slabs, all existing fill and unsuitable natural soils shall be excavated and replaced as properly compacted fill.
- B. Compaction: After grading, compact subgrade surfaces to the depth and percentage of compaction for each area classification.
- C. Fill placement and grading operations shall be performed only under the observation of the District 's Testing Laboratory.
- D. The exterior grades around building areas shall be sloped to drain away from the buildings to prevent ponding of water adjacent to foundations.
- E. Grading operation shall be conducted so as to prevent damaging effects of sediment product and dust on the site and adjoining properties.

3.06 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Transport excess excavated material and legally dispose of off site.

3.07 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction: District 's Testing Laboratory will observe, test and approve subgrades and fill layers before further construction Work can be performed. The District's Representative will determine the frequency of tests. Subgrade: Allow at least one field density test of subgrade to be made for every 2000 sq. ft. of paved area, but in no case less than 3 tests.
- B. Field examination and testing will be performed by the District 's Testing Laboratory. The Contractor shall cooperate with such testing and shall give the District's Representative advance notice of grading scheduling.
- C. Frequency of Tests for Trenching: As determined by the District's Representative.
- D. If in the opinion of the District's Representative, based on soil testing reports and observations, subgrades or fills which have been placed are below specified density, provide corrective work as specified at no additional expense to the District, and pay for retesting of the soil.

3.08 PROTECTION

- A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work as specified, with retesting, prior to further construction.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSES

PART 1 - GENERAL

1.01 SUMMARY

- A. Aggregate base course for curbs, gutters, sidewalks, and fire access driveway.

1.02 RELATED SECTIONS

- A. Section 31 20 00 Earthwork.
- B. Section 32 16 00 Curbs, Gutters, Sidewalks, and Driveways.

1.03 REFERENCES

- A. Standard Specifications for Public Works (SSPWC), latest edition.
- B. ASTM Standards.
- C. State Standard Specifications (SSS), Caltrans, latest edition.

1.04 SUBMITTALS:

- A. Submit material samples and reports in accordance with requirements of District.
- B. Submit samples in sufficient quantities for material testing.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Aggregate Base Material shall be either aggregate base as specified in Section 200-2.2 of the Standard Specifications for Public Works Construction (Latest Edition) or Class 2 Aggregate Base conforming to SSS Section 26-1.02A.
- B. Aggregate Base materials used within building areas shall be free of asphaltic materials.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify substrate has been inspected; gradients and elevations are correct, and dry.

3.02 AGGREGATE BASE PLACEMENT

- A. Aggregate base placement shall conform to the provisions of the SSPWC, Section 301
- B. Level and contour surfaces to elevations and gradients indicated.
- C. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- D. Where the required aggregate base thickness is 6 inches or less, the watered base may be spread and compacted in one layer. Where the required thickness is more than 6 inches, the aggregate base material shall be spread and compacted in 2 or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches.
- E. Aggregate base course shall be dense and unyielding upon proof-rolling with full water truck.

3.03 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch.
- B. Scheduled Compacted Thickness shall conform to the provisions of the SSPWC Section 301-2.2.

3.04 FIELD QUALITY CONTROL

- A. Inspection and testing shall be performed by the District's Testing Laboratory. Compaction testing will be performed in accordance with ASTM D1557, latest edition.
- B. If tests indicate work does not meet specified requirements, remove work, replace and retest at Contractor's expense.

END OF SECTION

SECTION 32 12 16

ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.01 SUMMARY

- A. Asphaltic concrete paving for parking lots and driveway pavements.

1.02 RELATED SECTIONS

- A. Section 31 20 00 Earthwork.
- B. Section 32 11 23 Aggregate Base Course.

1.03 REFERENCES

- A. Standard Specifications for Public Works Construction (SSPWC), latest edition.
- B. ASTM Standards.

1.04 SUBMITTALS

- A. Submit asphalt concrete mix design(s) for approval of the District Representative.

1.05 TESTING AND INSPECTION

- A. Testing and inspection of asphalt pavement mix(es) and testing of placed stabilizing base course and asphalt pavement will be performed by the District's Testing Laboratory. Testing and inspection will be performed so as to minimize disruption of work.
- B. Allow the District's Testing Laboratory access to the mixing plant for verification of weights or proportions, character of materials used and determination of temperatures used in the preparation of asphaltic concrete mix.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Provide the aggregate base, and bituminous surface conforming to the requirements of the Standard Specifications for Public Works Construction (SSPWC).

2.02 PAVING MATERIALS

- A. Asphalt Concrete: Asphalt concrete material shall be C2-PG 64-10 per SSPWC Section 203.-6. The grading and proportioning of aggregates shall be such that the combined mineral aggregate conforms to the specified requirements.
- B. Asphalt Emulsion: SSPWC Section 203-3, Grade SS-1h.
- C. Prime Coat: Grade SC-70 per SSPWC Section 203-2.
- D. Aggregates for base course shall conform to requirements of Specification Section 02231, Aggregate Base Course.

2.03 ASPHALT PAVEMENT MIX

- A. Combine mineral constituents in proportions to produce a mixture conforming to requirements of the SSPWC Section 203-6.
- B. Percentage by weight of asphalt cement in mixture shall be in accordance with SSPWC Section 203-6.
- C. Maintain thorough and uniform mixture.
- D. Bring asphalt and mineral constituents to required temperatures before mixing. Ensure aggregates are sufficiently dry so as not to cause foaming in mixture.

PART 3 – EXECUTION

3.01 GENERAL

- A. Execute Work in accordance with SSPWC Section 302.

3.02 PREPARATION

- A. Ensure grading of subgrade to required elevation. Subgrade preparation shall be per SSPWC Section 301.
- B. Before final rolling, shape entire section, add additional sub-soil if necessary, and compact subgrade to provide grades, elevation and cross-section indicated. Points of finished subgrade surface shall be within 0.04 foot of elevations indicated on the Drawings.

3.03 BASE COURSE

- A. Place aggregate base in accordance with requirements of SSPWC Section 301 and to the thickness shown on the Drawings. Grade and compact in 6-inch layers to at least 95 percent of compaction (ASTM D1557).

3.04 MAINTENANCE

- A. Maintain the base course until the asphaltic pavement is in place. Maintenance shall include drainage, rolling, shaping and water as necessary to maintain the course in proper condition. Maintain sufficient moisture at the surface to prevent a dusty condition. Areas of completed base course that are damaged shall be conditioned, reshaped and re-compacted in accordance with the requirements of the Specifications without additional cost to the District.

3.05 TACK COAT

- A. Prior to the application of the asphalt concrete, a paint binder (tack coat) shall be applied to all surfaces of walkway, curbs, gutters, manholes and drainage structures which will be in contact with asphalt pavement per SSPWC Section 302-5.4.
- B. Coat surfaces of catch basins which are to remain free of asphalt with oil, or provide equivalent protection, to prevent asphalt adhesion.

3.06 PRIME COAT

- A. Prior to the application of the asphalt concrete, a prime coat shall be applied at a rate of 0.20 to 0.40 gallons per square yard.

3.07 ASPHALT CONCRETE

- A. Requirements: The bituminous concrete shall consist of mineral aggregate, uniformly mixed with bituminous material in a central plant in accordance with SSPWC Section 400-4. The percentage of asphalt binder shall be in accordance with SSPWC Section 400-4. The mixing plant and construction equipment shall conform to the requirements of SSPWC Sections 302-5 and 400-4.
- B. Placing: Deliver bituminous mixtures to the work site temperatures specified in SSPWC Section 302-5.5. Spread and place in accordance with SSPC Section 302-5.5. Asphalt surface shall be fog-sealed.
- C. Compaction: Initial or breakdown rolling and the final rolling of the uppermost layer of the asphalt concrete shall be in accordance with SSPWC Section 302-5.6. Compaction by vehicular traffic shall not be permitted.

3.08 JOINING PAVEMENT

- A. Carefully make joints between old and new pavements or between successive days work in such manner as to insure a continuous bond between old and new sections of the course in accordance with SSPWC Section 302.
- B. Expose and clean edges of existing pavement. Cut edge to straight, vertical surfaces. Paint all joints with a uniform coat of tack coat before the fresh mixture is placed. Prepare joints in the new pavement in accordance with SSPWC Section 302-5.7.

3.09 JOINING NON-PAVED AREAS

- A. Where paving will join landscape or other non-hardscape area a redwood header shall be installed.

3.10 TOLERANCES

- A. Flatness: Maximum variation of 1/8 inch when measured with a 10-foot straight edge.
- B. Variation from True Elevation: Within 1/4 inch.

3.11 FIELD QUALITY CONTROL

- A. Inspection and testing shall be performed by the District's Testing Laboratory.
- B. Field inspection and testing will be performed by the District's Testing Laboratory. The Contractor shall cooperate with such testing and shall give the District Representative advance notice of paving scheduling. Sufficient "Advance Notice" shall be determined by the District Representative.
- C. If tests indicate materials do not meet specified requirement, replace material and retest at no additional cost to the District.
- D. Frequency of Test: As determined by the District's Testing Laboratory.

3.12 PROTECTION

- A. After placement, protect pavement from mechanical injury.

END OF SECTION

SECTION 32 16 00

CURBS, GUTTERS, SIDEWALKS

PART 1 – GENERAL

1.01 SUMMARY

- A. Concrete for curbs, gutters, sidewalks.

1.02 RELATED SECTIONS

- A. Section 31 20 00 – Earthwork

1.03 REFERENCES

- A. Standard Specifications for Public Works Construction (SSPWC), latest edition.
- B. ASTM Standards.

1.04 SUBMITTALS

- A. Submit the following:
 1. Product Data: Provide data on admixtures and curing compounds.
 2. Concrete mix design(s).
 3. Certificates from the batch plant.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with the SSPWC, latest edition; and ASTM Standards, latest edition.
- B. Obtain cementitious materials from same source throughout.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when base surface temperature is less than 40 degrees F or surface is wet.

PART 2 – PRODUCTS

2.01 FORM MATERIALS

- A. Form Materials: Section 303-5 of the SSPWC.

2.02 CONCRETE MATERIALS

- A. Concrete Material for Curbs, Walk (Path of Travel), and Pavement:
 - 1. Class 520-C-2500 for cast-in-place curbs, and gutters. Portland cement concrete per Standard Specifications for Public Works Construction Section 201-1.1.2.
 - 2. Concrete reinforcements shall be constructed per the Project Plans and Specifications.

2.03 ACCESSORIES

- A. Curing Compound shall conform to SSPWC Section 201-4. Pigmented compound shall not demonstrate any residual coloring of the concrete after one week.

2.04 CONCRETE MIX

- A. Mix and deliver concrete in accordance with ASTM C94.
- B. Use accelerating admixtures in cold weather only when approved by the District's Representative. Use of admixtures will not relax cold weather placement requirements.
- C. Use calcium chloride only when approved by the District 's Representative.
- D. Use set retarding admixtures during hot weather only when approved by the District 's Representative.

2.05 CONCRETE REINFORCEMENT

- A. Concrete reinforcement shall conform to SSPWC Section 201-2.

2.06 SOURCE QUALITY CONTROL

- A. Provide certificates of compliance from the batch plant.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify compacted subgrade is acceptable and ready to support imposed loads.
- B. Verify gradients and elevations of subgrade are correct.

3.02 PREPARATION

- A. Moisten subgrade to minimize absorption of water from fresh concrete. Compact subgrade material to a depth of 12" beneath 4" of sand below concrete pavements to a minimum 90% of the maximum dry density.
- B. Coat surfaces of catch basin frames with oil to prevent bond with concrete pavement.
- C. Notify District's Representative a minimum of 24 hours prior to commencement of concrete placement operations.

3.03 FORMING

- A. Place and secure forms to correct location, dimension, and profile.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with SSPWC Section 303-5.
- B. Install ½" thick fiberboard expansion joint and snap cap. Seal with Sikaflex self-leveling sealant after removal of snap cap (typical).
- C. Construct weakened plane joints conforming to SSPWC Section 303-5.4.3, one inch deep, at intervals not exceeding 10 feet.
- D. The top edges of curbs shall have 0.5" radius.

3.05 FINISHING

- A. Concrete finishes shall be per SSPWC Section 303-5.5.
- B. Portland cement concrete paving shall have a medium salted finish for slopes less than 6%, and slip-resistant at slopes of 6% or greater.
- C. Walkway grades in excess of 5% shall conform to requirements of Section 11B-302 California Building Code (2022 edition).
- D. Place curing compound in accordance with SSPWC Section 303-5.6 on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.06 FIELD QUALITY CONTROL

- A. Inspection and testing shall be performed by the District's Testing Laboratory.

- B. District 's Testing Laboratory will perform slump and compressive strength tests.
- C. Contractor shall maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.07 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, vandalism and mechanical injury.
- B. It is the Contractor's responsibility to replace all concrete work subject to vandalism and graffiti at no extra cost to the District.

END OF SECTION

SECTION 32 17 23
PAVEMENT MARKINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Surface preparation and field application of pavement marking on hot-mix asphalt paving and Portland cement concrete paving.

1.02 RELATED SECTIONS

- A. Section 32 12 16 – Asphalt Concrete Paving

1.03 REFERENCES

- A. *Standard Specifications for Public Works Construction (SSPWC)*, 2012.
- B. *Federal Standard 595C*. - Colors Used in Government Procurement.
- C. *California Building Code (CBC)*, 2010.
- D. *State of California Department of Transportation Standard Specifications (SSS)*, Caltrans, 2010 Edition.

1.04 SUBMITTALS

- A. Product Data:
 - 1. Material List: Provide an inclusive list of required coating materials, including primers and other surface preparation materials. Indicate each material and cross-reference specific coating and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
 - 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. Results of preconstruction field testing.

1.05 QUALITY ASSURANCE

- A. Standards: Comply with U.S.D.O.T. Federal Highway Administration “Standard Specifications for Construction of Roads and Bridges”, Section 634: Traffic Markings for Wet-Applied traffic paints. Also, comply with State of California Department of Transportation “Standard Specifications 2010” and Standard Plans 2010”. Applicable Sections – Section 84, “Traffic Stripes and Pavement Markings,” and Section 85, “Pavement Markers”. California Building Code (CBC).
- B. All paint shall comply with governing Air Quality Management District AQMD rules and regulations and in accordance with the California Air Resources Board (CARB) rules in effect at the time of application.
- C. Source Limitations: Obtain each type of pavement marking material from one source and by a single manufacturer.
- D. Installer Qualifications: Engage an experienced installer who has completed pavement marking similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance of at least 5 years.
- E. Pre-Application Field Testing: Prepare a sample marking of each different paint formulation on asphalt substrates for the purpose of establishing quality of application, adherence of paint to the substrate, compatibility of the paint with the asphalt, and to determine whether a primer will be necessary if not otherwise required by the manufacturer.
 - 1. Minimum length of test stripe: 3 feet.
 - 2. Perform a minimum of 3 test stripes, located to provide a representative sample of entire area indicated to receive pavement marking paint.
 - 3. Apply test markings using methods and equipment recommended by the manufacturer of the marking paint and as specified in this Section.
 - 4. Arrange for a technical representative of the marking paint manufacturer to observe cured test samples and provide written recommendations for changes, if any, to materials or methods necessary to achieve optimum paint performance on specific substrates.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.07 PROJECT CONDITIONS

- A. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 50 deg F, and not exceeding 90 deg F.

PART 2 - PRODUCTS

2.01 PAVEMENT MARKING MATERIALS

- A. Pavement-Marking Paint: Attention is directed to Section 210-1.6, "Paint for Traffic Striping, Pavement Marking, and Curb Marking" of the Greenbook and Section 84.3 "Painted Traffic Stripes and Pavement Markings" of the Caltrans Standard Specifications. Lead free latex, water-base emulsion, ready-mixed, complying with FS TT-P-1952, and suitable for use on both hot-mix asphalt and Portland cement concrete paving. Provide material having a volatile organic compound (VOC) content of 250 g/L, or less.
 - 1. Colors:
 - a. Color: White (for all parking stalls other than disabled access parking, for traffic and lane marking, crosswalks, signs and for painted text).
 - b. Color: Yellow, where indicated.
 - c. Color: Red (for "No Parking" and fire lanes areas as shown).
 - d. Color: Blue (for pavement markings identifying disabled access parking and paths of travel).
 - e. Color: Black Borders around directional arrows where indicated.
 - 2. Gloss: Flat or eggshell with gloss at 30 percent or less when measured at a 60-degree meter.
 - 3. Painted lines and markings on pavement shall be 4" minimum wide.
 - 4. Parking spaces for the disabled shall be marked according to figure CBC 11B-18A, 11B-18B, and 11B-18C.
 - 5. Tactile warning lines shall be in conformance to CBC Section 11B-705.1 and 11B-705.2.
- B. Reflective Pavement Markers: Bi-directional pavement markers, 4" x 4" x 3/4" high, single-color, conforming to State of California and Federal specifications; Stimsonite 88 Reflective Pavement Markers, Model V16C-88AY Yellow, distributed by Hawkins Traffic Safety Supply Division of Hawkins-Hawkins Company, Inc. or equal.
- C. Primer: Type recommended by the marking paint manufacturer.
- D. Detectable warning surface shall be constructed in accordance with CBC 11B-705.1.
 - 1. Raised truncated domes
 - a. Staggered pattern.

- b. Diameter of nominal 0.9 inch (22.9mm) at base tapering to 0.45 inch (11.4mm) at top.
 - c. Nominal height of .2(5.08mm) inch.
 - d. Nominal center to center spacing of 2.35 (59.7mm) inches.
 - e. Color “yellow” conforming to Federal Color No. 33538 shown on Table IV of Standard no. 595C.
- E. Surface Cleaning Material: Cleaning agent or agents suitable for removing grease, oil, and other contaminants that will not damage asphalt or Portland cement concrete paving and are acceptable to pavement marking paint manufacturer.

PART 3 - EXECUTION

3.01 PAVEMENT MARKING

- A. Attention is directed to Section 314 “Traffic Striping, Curb and Pavement Markings and Pavement Markers” of the Greenbook.
- B. Preparation: Furnish an experienced technician to supervise the location, alignment, layout, dimensions, and application of pavement markings.
- C. Allow paving to cure for a minimum of 30 days before starting pavement marking. Comply with recommendations of the pavement marking paint manufacturer for longer cure periods.
- D. Thoroughly mix paint prior to application.
- E. Sweep and clean surface to eliminate loose material and dust. Ensure all surfaces indicated to receive pavement marking are clean and free from grease, oil, concrete sealers and curing agents, and other contaminants that might interfere with paint adhesion.
 - 1. Comply with manufacturer's instructions for use of special cleaning agents.
 - 2. For removal of substances that would interfere with paint adhesion use methods recommended by the paint manufacturer if applicable, or methods that will completely remove the substance without damaging or discoloring the underlying pavement substrate.
- F. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates based on substrate type and cure conditions to provide a minimum wet film thickness of 15 mils and dry film thickness of 8 mils, unless otherwise recommended by the manufacturer.

- G. Comply with paint manufacturer's maximum recommended drying time before allowing traffic in order to prevent undue softening of bitumen and pick-up, displacement, or discoloration of pavement marking by vehicular traffic.
- H. Paint pavement, curbs, and other surfaces as shown on the Drawings. Painting shall be straight, uniform, exact, and sharp without blobs at the start and finish. Edges shall be even, accurate, symmetrical, and free of fuzziness.
 - 1. Edge Tolerance: 1/2 inch in 20 feet, maximum.
- I. Apply markings for disabled access symbols in accordance with State of California Building Code, Part 2, Title 24, California Building Standards.
- J. Where work consists of modifications of, or additions to existing pavement marking, match existing color and line width.

3.02 ADJUSTING

- A. Touch up pavement markings not complying with requirements of this Section by painting out the errors with permanently opaque paint of the same color as the substrate pavement.
 - 1. Block out and eliminate all traces of splashed, tracked, and spilled pavement marking paint from the background surfaces.
 - 2. Paint over deviations in marking edges exceeding allowable tolerance and apply new marking meeting specified requirements.
- B. The Owner reserves the right to require sandblast removal of extensive defective pavement marking and application of new marking meeting specified requirements at no additional cost.

3.03 PROTECTION

- A. Provide traffic cones, barricades, and other devices needed to protect the pavement marking until it is sufficiently dry to withstand traffic without damage.

END OF SECTION

SECTION 33 40 00

STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Storm drainage piping, fittings, accessories, and bedding.
- B. Catch basins.
- C. Manholes.
- D. Inlet and outlet structures.

1.02 RELATED SECTIONS

- A. Section 31 20 00 Earthwork.
- B. Section 31 23 33 Trenching and Backfilling.

1.03 REFERENCES

- A. Standard Specifications for Public Works Construction (SSPWC), latest edition.
- B. ASTM Standards.

1.04 SUBMITTALS

- A. Submit the following in accordance with provisions in Division 1:
 - 1. Product Data: Provide data indicating pipe, pipe accessories and catch basin grates.
 - 2. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
 - 3. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
 - 4. Layout diagram for storm drain components per plan.

1.05 PROJECT RECORD DOCUMENTS

- A. Submit record drawings. Accurately record locations of pipe runs, connections, catch basins, structures, manholes and invert elevations.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 FIELD MEASUREMENTS

- A. Verify that field measurements and elevations are as indicated on drawings.
- B. Complete pothole work per plans and notify the District of any discrepancy prior to commencing construction.

1.07 COORDINATION

- A. Coordinate the work with connection to existing storm drain mains, and trenching.

PART 2 – PRODUCTS

2.01 PIPE MATERIALS

- A. Polyvinyl Chloride (PVC) SDR35, per SSPWC Section 207-17.

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. Fittings shall be watertight.
- B. Solvent cap cement: pipe with solvent cement joints per SSPWC Section 207-17.3.3.

2.03 CATCH BASINS AND MANHOLES

- A. Precast catch basins shall include traffic rated grate, as manufactured by Brooks or approved equal 3.
- B. Cast-in-Place catch basins per Utility Improvement Plan.

2.04 METAL

- A. All exposed metal parts are to be galvanized in accordance with SSPWC, Section 210-3.

2.05 CONCRETE

- A. All concrete shall be Class 560-C-3250, per SSPWC Section 201.

2.06 BEDDING MATERIALS

- A. Refer to Specification Section 31 23 33 Trenching and Backfilling for Bedding Material.

2.07 FILTER FABRIC

- A. Filter fabric shall be non-woven geosynthetic per SSPWC Section 213-5.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that trench cut is ready to receive Work and excavations, dimensions, and elevations are as indicated on Drawings.

3.02 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with compacted bedding material.
- B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.03 BEDDING

- A. Excavate pipe trench in accordance with Specification Section 31 23 33. Hand trim excavation for accurate placement of pipe to elevations indicated on Drawings.
- B. Place bedding material in trench bottom, level materials in continuous layer. Bedding shall be 1/2 of pipe diameter or 4" minimum thickness whichever is greater, compact to a minimum of 95 percent of maximum dry density.
- C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION - PIPE

- A. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Construct tongue-and-groove mortar type of joint on RCP per SSPWC Section 207-2.5.
- B. Lay pipe to slope gradients noted on drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- C. Install sand backfill along sides and over top of pipe. Provide sand backfill over top of pipe to minimum compacted thickness of 12 inches, compacted to a minimum of 95 percent of maximum dry density.
- D. Refer to Specification Section 31 23 33 for Trenching Requirements. Do not displace or damage pipe when compacting.

- E. The compaction of the backfill material along the sides and one foot above the pipe shall be done with hand tampers or equal to protect the pipe.

3.05 INSTALLATION - CATCH BASINS, MANHOLES

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place cast-in-place concrete base with provisions for storm drainage pipe end sections.
- C. Level top surface of concrete base to receive shaft sections.
- D. Establish elevations and pipe inverts for inlets and outlets as indicated on drawings.
- E. Compact top 12" of native materials below the bottom of catch basins and manholes to minimum 95 percent of maximum dry density.

3.06 FIELD QUALITY CONTROL

- A. Inspection and testing shall be performed by the District's representative.
- B. Request inspection prior to and immediately after placing backfill cover over pipe.
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to the District.

3.07 PROTECTION

- A. Protect pipe and backfill cover from damage or displacement until backfilling operation is in progress.

END OF SECTION